STUDIES

Study for the promotion of an industrial development pole in southern Italy

Volume I

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CONTENTS

I. *ORIGIN OF THE METHOD*

The method used in promoting industrial development poles arose from discussions promoted by Community bodies of experience in regional policy gained in the member countries.

Regional problems in outlying areas such as the west and south-west of France and the south of Italy (Mezzogiorno), which were virtually by-passed by the industrial revolution of the nineteenth century, differ widely from those of the central area of the Community, where there are already major industrial centres.

In the heartland of the Community, where there are large, thriving industrial centres side by side with less developed areas—areas which were industrialized a long time ago and have lost their dynamism or which have remained almost exclusively agricultural—the object of regional policy is to improve the geographical distribution of economic activity. The systems of development aid elaborated empirically by the individual member countries have been the more effective in that they tended rather to speed up and orientate natural economic processes than to create new growth points.

In the peripheral areas, on the other hand, the problem has proved more intractable.

The classic systems of promotion, even when they offer incentives, tend to attract heavy capital-intensive industry and manufacturing industries enjoying considerable natural geographical protection and capable of operating on the local market; other manufacturing industries, however, they attract much less.

The development possibilities of basic industries are obviously limited. Industries serving the local market, for their part, cannot be developed greatly unless exports outside the area are built up at the same time, the proceeds of which will feed the economic circuit inside the area. If in the region there are not sufficient other industries to provide the motive power, as are to be found in areas with a high density of population, then in order to encourage economic development manufacturing industries must be set up which cater for much wider markets (1).

The peripheral regions of the Community have here and there succeeded in establishing short-cycle industries such as:

i) large complexes of basic industries, for example: iron and steel, petrochemicals and fertilizers;

ii) industries processing local agricultural products;

iii) industries which, enjoying considerable natural geographical protection, work for the local market, such as building materials and aerated beverages.

But when these regions carry the process of industrialization further and try to set up more elaborate manufacturing industries, for instance mechanical and electrical engineering and chemicals, such industries are not able to operate at competitive production costs. To set up or to develop this type of industry it would be necessary to provide considerable customs and quota protection, a solution that is ruled out by the very principle of the Common Market. It was therefore necessary to seek, with the countries concerned, a new method making it possible, once the initial phase was completed, to enable industries, in particular complex-cycle industries, to develop independently in certain areas of the Community's outlying regions.

II. *BASIC ECONOMIC ANALYSIS*

During the 19th century and until the 1914 War, the transportation of raw materials was very costly and transporting coal and iron was uneconomic. The price of these materials increased rapidly with distance from the mines or blast furnaces.

That is why the steel industry was established near coal fields or iron-ore deposits and the engineering industries near the blast furnaces.

Moreover, mechanical engineering in those days was very different from the modern industry. Inter-industry exchanges were on a very small scale. The steel and coal were purchased, after which all the operations leading to the finished product were performed in one and the same factory. This was the age of vertical integration.

Industry today is quite different.

The first line in an input-output table—basic industries—and the last—industries manufacturing finished products—which constituted the whole table fifty years ago, represent only a diminishing part of total industrial activity nowadays, while activities producing intermediate goods and services have taken up a preponderant position.

The immense gains in industrial productivity over the last fifty years have been possible only because of ever-increasing specialization in each production factor and within each establishment. To be competitive in a modern economy, an establishment must concentrate its effort—particularly its technical effort—on its main activity, which has often become its sole activity,

(1) See "Reports by groups of experts on regional policy in the European Economic Community" — I. Objectives and methods of regional policy — (EEC publication — DG II, Brussels, July 1964).

and depend for all intermediary operations on specialized establishments, which act as sub-contractors and supply goods and services.

Each manufacturer can thus concentrate on a single, strictly limited operation, in which he gets his costs down far lower than if his effort were dispersed over a range of operations, even if these were interrelated.

The corollary of a high degree of specialization of this kind is a high degree of dependence of each manufacturer on a number of other manufacturers—that is, on external economies.

Conditions of transport are now such that it can be claimed that the world market in raw materials has become a homogeneous one. The same goes for most of the products—semi-products, chemicals, and even nuts and bolts, etc.—which being precisely defined can be sold by catalogue. These products, therefore, no longer tie industries to specific areas.

In order to produce, a manufacturer must have close at hand all the intermediary industries: sub-contractors, i.e. firms concerned at one stage or another in the manufacture of a specific article, and suppliers of services, in particular those whose function is installation and maintenance of plant.

None of this intermediary work will be a paying proposition if it is done for a single customer. Each intermediary manufacturer must devote himself to one operation only, but he must do this for a large number of user industries. Only then can he attain the production level necessary to bring his costs down low enough to justify his existence.

Consequently, it is quite clear that for complex-cycle industries an entrepreneur can only reasonably envisage manufacturing a finished product in centres where he can find all the industries auxiliary to his own. Conversely, a subcontractor or supplier of services will only set up in an area with an adequate market in the shape of firms requiring his specialized services.

This is the vicious circle that must be broken in order to set in train the industrial development of large underdeveloped regions.

III. *METHOD OF PROMOTION OF INDUSTRIAL DEVELOPMENT POLES*

To achieve this aim it is necessary to create *ab ovo* the whole network of technical relations which are characteristic of a modern industrial centre.

As an undertaking of this magnitude was, however, almost impracticable, the problem was narrowed down to ascertaining the minimum of external economies necessary for the functioning of complex-cycle industries.

Two factors help to keep this minimum initial nucleus down to feasible dimensions. They are:

i) The division of industrial trade into products sold by catalogue, where a considerable distance between supplier and customer is hardly felt, and intermediary operations, where industries need to be close to other manufacturers;

ii) The specific character of intermediary industries.

The intermediary industries, in particular maintenance firms and subcontractors, operate in a specific sector; they are designed for a specific category of user industries, which may be defined as all the industries calling upon intermediary trades.

In this way, each of the main industrial sectors:

a) Heavy and medium mechanical engineering;

b) Chemicals;

c) Light engineering, electricity and electronics;

d) Textiles,

is a sector with its own problems of location.

To attain in an urban centre the volume of industrial concentration needed to make the system of technical exchange work for at least one of these sectors, efforts must be directed towards one sector only, because financial and human resources are limited.

After selecting the town in which such efforts are to be concentrated and singling out the type of industry which offers the greatest chances of succees, the method of promoting industrial poles consists of seeking to provide the complex of intermediary industries needed by the industrial sector chosen, of promoting a sufficient number of key industries to justify economically the existence of the intermediary enterprises, and of seeing to it that both types of industry are set up at the same time.

The choice of the pole to be promoted is determined generally by an already existing concentration of human resources or by particularly favourable local conditions.

In order to select the branch of industry to be promoted it is necessary first and foremost to find which type of industry has the greatest prospects of success in the area selected. Not only must the technical conditions of production be borne in mind but also, and perhaps this is the more important aspect, the human conditions—the entrepreneur and what he is used to, the worker and what he is capable of. The success or failure of recently-established industries often provides a valuable hint as to the potentialities of the area itself. Indeed, the choice of the type of industries to set up in a town is often an empirical one.

The Commission of the European Economic Community and the High Authority of the European Coal and Steel Community applied this method to a pilot study which they put in hand at their own expense. This study is the subject of the present publication.

IV. *CHOICE OF LOCATION*

The Italian Authorities suggested that the study should cover a centre in the Mezzogiorno, but left it to the Commission to select the area most suitable for the operation.

The Mezzogiorno, as defined by the law on the subject, comprises eight regions:

i) Abruzzi and Molise
ii) Latium
iii) Campania
iv) Basilicata
v) Apulia
vi) Calabria
vii) Sicily
viii) Sardinia,

in which fifteen or so towns have already been classified as development areas.

The town which was to be the subject of the study had to be sufficiently large to receive not only the basic industrial nucleus, but also the subsequent developments of the pole itself; it had to have between 250 000 and 300 000 inhabitants and had to be able to reach the half million mark rapidly by the drift from the land of young people in its zone of influence and natural increase.

On the other hand, if useful conclusions were to be drawn, the study could not be carried out in a centre like the Naples-Salerno area, where the process of industrial development was already well under way. At the end of the operation it would have been difficult to distinguish the results of the promotion scheme from those which would have been achieved in any case. This was all the more reason for excluding Latina and Aprilia, industrial areas near Rome, where most industries work for the Roman conurbation.

The Calabrian development areas—Crotone, Reggio Calabria and Santa Eufemia—were to small for the purpose.

The choice was therefore limited to Sicily, Apulia and Basilicata.

In Sicily, the chemical complex in the Gulf of Augusta and the industrial area of Catania represent a considerable step towards a development pole based on the chemical industry.

In Apulia the three leading centres were: Bari (population 315 000) Taranto (200 000 and Brindisi (75 000).

Bari, which had been a mainly commercial town, had only two large works, neither of recent date, which employed over 500 workers: an oil refinery and a factory belonging to the tobacco monopoly, which processes various derived chemical products. Two or three medium-sized firms—one manufacturing special bodies for commercial vehicles — were developing at a normal rate. Furthermore, the Finanziaria Ernesto Breda company was constructing or planning four or five large plants and had detached a section from its Milan research institute.

In Taranto, all economic life was until recently bound up with the activities of the navy. Apart from the arsenal, the only large-scale private undertaking was a shipyard working mainly for the navy. A newcomer is the Italsider iron and steel complex which, it is planned, will have a final capacity of 6 million metric tons per annum. The first part, then under construction, has a capacity of 2 million metric tons per annum. Furthermore, various intermediary units have been planned, in particular a cement works which would use the slag from the blast-furnaces. The number of workers to be employed when the first part is working normally will be 4 500, but during construction as many as 10-12 000 were employed. A Shell refinery has been planned in Taranto, but building was postponed so that use could be made of the manpower becoming available on completion of the first Italsider plant.

Brindisi, a medium-size town, has an excellent natural harbour; the only old-established factory of some size was a Montecatini fertilizer plant; the same company was building a large plant to the south-east of the town, which will cover 600 hectares and employ 2 500 to 3 000 workers. During construction a labour force of 6 000 were employed; they were recruited over a vast area in the region of Apulia extending even north of Bari.

In Basilicata, a region whose economy is linked to some extent with that of Apulia, the discovery of natural gas in the Basento Valley led to the setting-up of three chemical works.

In Bari the Breda factories offer good development prospects in mechanical engineering. There is furthermore a good supply of manpower.

In Taranto the building of the first part of the Italsider steelmills resulted in the training of manpower nuclei in the industries concerned: for example, metal structures, electrical plant, boilermaking.

Brindisi's manpower supply was absorbed by the construction of the chemical complex, though it was to be expected that once the work was terminated a number of workers would become available. However, if we accept as valid the ratio of 1:12 between the industrial labour force in the strict sence and the population of a town, although Brindisi may expand to 100 000 inhabitants, one can hardly imagine another industrial complex there besides that centred on the Montecatini plant, which has now become the Monteshell complex.

In the Basento Valley, where, apart from the small town of Matera, there was no sufficiently large nucleus of population, it did not seem advisable to create *ab ovo* a centre whose development potential would have been entirely dependent on the necessarily temporary existence of a gas deposit.

The industrial development of the two regions of Apulia and Basilicata will be based on the metal-working industry and the chemical industry; the subject of the study however was not the overall development of one or other region in Italy, but the promotion of a specialized industrial pole. Now, from the points discussed so far, it appeared that only Bari, in conjunction with Taranto, possessed the characteristics required for such an operation.

To recapitulate, we may say that, leaving aside the large Naples-Salerno centre, which is already at an advanced stage of development, a scheme for promoting an industrial pole in accordance with the criteria described above was feasible in Bari, on the basis of heavy and medium mechanical engineering, or in Syracuse and Catania, on the basis of the chemical industry, in particular the manufacture of chemical products.

A preliminary examination seemed to show that the method was easier to apply to mechanical engineering than to chemicals.

The Commission therefore opted for the complex centred on Bari and Taranto.

On 31 July 1962 an Italian consultant firm, Italconsult, was asked to undertake the study.

V. *ITALCONSULT'S TASK*

Under the contract the study consisted of:

1. A socio-economic study of the area determining the zones of influence of Bari and Taranto, the availability of manpower in those areas, and the size of the labour force.

2. Study of the potentialities of the area: analysis of the present situation of the industrial sector and of technical, social and cultural overhead.

3. Study of key industries:

a) Determination of key industries to be set up with a view to long-term development of the area selected; this was to be done in the light of information gathered in the first two stages of the study.

b) For each production unit:

i) A market survey;

ii) A preliminary study specifying the dimensions and structure of the recommended production unit, determining the main technical factors: necessary investment with an indication of the nature of such investment, area and location of sites, consumption of water, energy, raw materials and miscellaneous supplies;

iii) A study of the profitability of investments, account being taken of fiscal and other concessions.

4. Study of intermediary industries

Determination of intermediary industries necessary in the first stage of the scheme; for each unit a summary preliminary study indicating the various economic and technical factors and the number of workers needed.

5. Determination of the educational and material infrastructures needed

6. Prospects for the natural development of the pole

a) A study of foreseeable developments in the industrial and services sectors resulting from the free play of market forces, taking as a starting point the industrial complex made up of:

i) Industries already in existence

ii) Key industries

iii) Intermediary industries.

b) Determination of the optimum size of the agricultural labour force, the rate of drift from the land, and changes in the agricultural economy caused by industrial development. Forecasts of job distribution in the area and average per capita income for 1970.

VI. *THE STUDY*

The first two chapters of the study provide a wide range of information on the region of Apulia; the text has been summarized for the present publication, while the tables, charts, etc. are published in full in Volume II.

Chapters 3 and 4, which form the nucleus of the study, are published in full: the text in this volume, the tables and charts in Volume II.

Chapter 5 has been abridged by Italconsult itself; the preliminary studies are available for industries interested in playing a part in the establishment of the pole.

Chapters 6 and 7 are given in full: the text in this volume and the tables in Volume II.

CHAPTER 1

Socio-economic analysis

1.1. TERRITORIAL BASES OF THE STUDY

For a description of the larger socio-economic area at European regional level in which the study of the Bari-Taranto pole is situated, the report refers the reader to earlier studies carried out by the EEC Commission's staff ([1]) (resident population 3.8 million in 1961; rate of increase 1951-61 0.6 % per annum; gross domestic product at factor cost Lit. 955 400 million, of which 35 % in agriculture, 25 % in industry—including building and construction, electricity, gas and water—and 40 % in services).

The preliminary aim of the Italconsult study was to determine the areas integrating the towns of Bari and Taranto and their hinterlands, observing the geographical pattern of some fundamental social and economic aspects which could be measured by means of available data and direct surveys: the commuting of workers and students, the circulation of newspapers, patient attraction areas of hospitals, farm supplies, various administrative aspects, and so on. Right from the beginning the results of these surveys suggested the consideration of a wider common area —Bari, Taranto and Brindisi—because of its degree of integration. As can be seen in the maps and tables annexed, the zones of influence of each of the three towns overlap considerably. This common integrated area covers approximately the three provinces corresponding to the three towns. For reasons of statistical convenience the report has as a rule taken the total area of the three provinces as the basis for all the ensuing studies on the pole.

([1]) EEC Commission — Conference on Regional Economies, Brussels, December 1961 (second part on Italy).

The report goes on to describe the areas of industrial development governed by the Bari, Taranto and Brindisi town planning schemes. These schemes, drawn up by the local development authorities (Consorzi) and approved by the Committee of Ministers for the Mezzogiorno, set out the infrastructure which must be provided to permit the development of industries in the three areas. In particular these plans specify the nature and location of industrial centres in relation to present and future infrastructure and of some residential centres resulting from the reorganization of urban structure in the areas they cover. Furthermore they determine the facilities for the industrial centres and the infrastructure specifically connected with them.

The charts which summarize the planning schemes for each town and the geographical distribution of other industrial nuclei in their hinterlands are to be found in the annex.

The account of the territorial bases of the study concludes with a description of the individual towns of Bari, Taranto and Brindisi:

The commune of Bari, with an area of 11 500 hectares, had a population of 315 000 in 1961 (280 000 in the main built-up area) plus a daily influx of 30 000.

The commune of Taranto, which is three times the area of Bari, had a 1961 population of 200 000—190 000 of these in the built-up area—and a daily influx of another 20-25 000.

The commune of Brindisi with much the same area as Taranto, had only 75 000 inhabitants in 1961, practically all of them living in the built-up area, plus some 10 000 daily commuters.

1.2. MANPOWER

Between 1951 and 1961 the population of the two provinces of Bari and Taranto rose from 1 625 000 to 1 730 000—an increase of 105 000—notwithstanding net emigration.

Birth rates and death rates are much the same in the two provinces: 2.3-2.4 % per annum and 0.9 %, leaving a balance of 1.4-1.5 % per annum. On the other hand, the emigration rate of Bari province was almost double that of Taranto. In Bari there was a net decrease of 126 000. In relative terms, net emigration from the province of Bari was about 75 % of net emigration from the whole area of the pole, with a peak among under-ten-year olds.

If the emigration rates per age category for 1951-61 persist, more than two-fifths of the young people will definitely leave the region sooner or later to find work in northern Italy or in the other Community countries; many of these emigrants, however, remain unskilled labourers for the rest of their lives.

However, while the working population was decreasing, in relation to 1951, by 0.2 % in the Mezzogiorno as opposed to 0.1 % in central and northern Italy, in the pole area it was increasing by 53 000 or 0.7 %. This growth is due entirely to the considerably increased percentage of women in the labour force, an increase partly brought about by the need to fill

the gaps left by emigrating males. This fact explains the reduced percentage of men working in agriculture and the sharp increase in women (see table 1.2. - XXI). The drift from the land in the area, however, had not reached in 1961 the level found in the rest of Italy.

During the period, industrialization in the pole area went ahead more slowly than in the other regions of the Mezzogiorno, although considerable progress was made.

It is calculated that in 1961 there were about 43 700 persons unemployed in the area. The male unemployment rate was of the same order as in the country as a whole: 5.6 % (19 300) in Bari province, 8.7 % (11 300) in Taranto province, 5.3 % (59 400) in the whole region, which compares with an average of 6.5 % of the entire Mezzogiorno and a national average of 4.4 %. Two-thirds of the unemployed in the region are young people looking for their first job, of which 13 000 in the province of Bari and 8 000 in the province of Taranto. They were mainly concentrated in age groups between 14 and 25 accounting for 90 % of the total. It is interesting to note that the percentage of persons seeking their first job, from 14 to 21 years of age, had increased greatly: from 8.4 % to 13 % in the area and from 12.4 % to 15 % in Bari province. The population in the area showed in general slightly higher unemployment rates than those for the combined regions of Apulia and Basilicata, except in the province of Taranto where they were very high, especially in industry (see Table 1.2. - XXIX). It must be pointed out that 22-25 % of the working population was employed in industry, 18 % in manufacturing industry in Bari province and 16.3 % in Taranto province.

Table 1.2 - XXXII shows that 45-52 % of the working population was employed in agriculture. Agriculture in the area, however, needs reorganizing radically and its labour force must be cut down drastically.

Other details on the breakdown of the labour force by industry or occupation are given in the tables annexed.

The last part of the chapter gives conventional calculations of the trend of total population, first assuming no migration and then applying two assumptions concerning net emigration rates.

1.3. QUALITATIVE ANALYSIS OF MANPOWER

Illiteracy, which was long one of the obstacles to economic development in this area—as in the whole of southern Italy—has practically disappeared in the younger generation. While more than two-thirds of those aged over 65 had no educational qualifications at all according to the census, which means in practice that they are illiterate, the percentage of young people arriving at working age without educational qualifications had dropped to 16 % in rural areas and 7-8 % in the towns. According to the 1961 census, in rural areas over 80 % of youths had the primary school-leaving certificate (licenza elementare) and 7.5 % the intermediate certificate (licenza media); in the non-rural areas, more than half had the intermediate certificate and more than a quarter the secondary certificate (licenza liceale).

As regards general education, therefore, the situation now seems to be about satisfactory. Vocational training, on the other hand, seems to leave much to be desired since, in the words of the report:

"Owing to deficiencies in courses and teachers, the training given does not meet the requirements of industry, which means that further training has to be provided on the job."

To remedy this situation, the Cassa per il Mezzogiorno has set up inter-company training centres with courses tailored to the needs of the new firms in the area, but these centres will have to be extended considerably to provide the numbers of trained personnel required by the firms that are to be set up.

Turning to secondary technical education, the report puts the number of industrial technicians (periti industriali) taking their diplomas over the next five years at 460 - 180 in mechanical engineering and 280 in electrical engineering.

The only higher technical training available in the area is provided at Bari, which produces only civil engineers.

In 1961 twelve graduated as construction engineers, 40 as transport engineers and 15 as hydraulic engineers. The Bari faculty has no plans for an industrial engineering section.

But the report estimates that, in 1959, 500 students from the region graduaded from universities in other regions; all Apulia's industrial engineers, then, have been trained in Naples or the north.

Tables 1.3 - XXXVI sqq. show the numbers employed in the various industries, with breakdowns by trade, size of unit and province.

As the most intelligent candidates can be selected, and as they are keen to find good, steady jobs, the training period can be shorter than would be necessary in an already industralized area, where potential workers who have reached twenty years of age without any

training are generally of limited mental ability. Despite their qualities, however, these youths have some difficulty in adjusting themselves to the social relationships found in normal industrial establishments.

Nevertheless, experience gained in areas where modern industry was introduced less recently (notably in Sicily, around Syracuse and Catania) shows that these problems can be resolved after a few years.

1.4. LIVING STANDARDS

The report makes a comparative analysis of the standard of living in the pole area, in relation to Italy and the EEC as a whole, on the basis of macroeconomic aggregates and indicators of its components.

Among macroeconomic aggregates the gross product is examined since it is impossible to determine income because of insufficient information on net receipts of factors coming from outside the area. Gross product per capita at market prices in the area seems to be about 60 % below the EEC average. Even if we suppose that the data supplied by Italian statistics relating to the gross product are underestimated by 10 %, per capita income in the area would still be only half the average for the Community.

Furthermore, an empirical quantitative analysis of factors which are difficult to measure, such as the divergence of relative prices and the diverse structure of demand because of different tastes and climatic and environmental differences, would reduce the gap in relation to the Community average. The conclusion is then reached that the standard of living in the area, at any rate in terms of per capita consumption, would be equivalent to only 60 % of the EEC regional average despite certain adjustments.

Next, the report analyses the standard of living from the real indicators of its components in order to eliminate, without having recourse to the adjustments described above, the influence of the variables of relative prices and expenditure. The report notes that, on the other hand, there are profound divergences due to differences in social structure, climate, etc. Within these limits, the death rate in the area appears to be almost twice the EEC average; the ratio of hospital beds to inhabitants 40 % lower than the EEC average; primary school attendance 5 % lower; the number of rooms per inhabitant 30 % lower; the number of motor vehicles and telephones per head one third lower; the number of radio and television licence-holders half the average; the ratio of unemployed and underemployed to the labour force over double.

CHAPTER 2

The potentialities of the region

The first section gives the value added by each industry in 1951, 1961 and 1963 thus establishing their relative importance.

It is seen that as late as 1951 industry in Apulia and Basilicata showed the typical features of underdeveloped areas (product deriving predominantly from traditional activities).

Next, a general picture is drawn of developments in industry from 1951 to 1961 and it is observed that these developments are much less marked than in the following period from 1961 to 1963. In this respect 1961 represents the turning-point for the development of Apulia and Basilicata. From 1951 to 1961 industrial production in the two regions expanded at an average rate of 6.8 % per annum on the basis of value added at constant prices (base year 1961).

As there are no official statistics showing the trend of industry since 1961, the report relies on the concrete evidence of the major projects carried out or put in hand (the Italsider complex in Taranto, the Monteshell complex in Brindisi, AGIP's development of the Basento Valley natural gas deposits in Lucania and, in the same area, three vinyl-chloride plants built by competing groups).

From 1961 to 1963 the value of industrial production (in terms of value added) probably increased by 31 % at constant 1961 prices.

The report points out that, as a general rule, the structure of industry is tending to align itself on that of industry in more developed regions and areas.

After this general survey, the study analyses in turn all the industries in the area.

The main branches examined are the following:
A. Mining and quarrying; B. Manufacturing; C. Construction and installation of plant; D. Electricity, gas and water.

A. *MINING AND QUARRYING*

Mining and quarrying employed 7 600 persons in 1961, with a turnover of Lit. 19 000 million. At that time there were still in the two regions of Apulia and Basilicata industries of typical craft structure, side by side with others having an industrial structure. Out of a total of 626 industries in the two regions only 38 were classified as "medium" or "large". From 1951 to 1961 employment in these industries increased at an average annual rate of 4.4 % and production at 13 %.

Mining and quarrying include:

1. *Mining of metalliferous ores:*

Mainly bauxite mines, representing 83 % of national output.

In this branch in general there are three mines, of which one is classified as "large" and one as "medium"; 469 persons were employed and the turnover was Lit. 657 million.

2. *Extraction of fossil fuels:*

Lignite, petroleum and natural gas. The Basento Valley natural gas deposits, totalling between 10 and 20 000 million cubic metres, are of particular importance but were not yet being tapped in the base year. There were two enterprises, of which one of "medium" size, employing 26 persons and with a turnover of Lit. 87 million.

3. *Quarrying of marble, ornamental and building stone, and other building materials:*

There were 611 quarries in 1961, of which 6 "large" and 27 "medium". They employed 5 961 persons and had a turnover of about Lit. 8 000 million.

Average growth rate from 1951 to 1961: 10.1 % per annum.

4. *Mineral waters:*

Six mineral water wells employing 90 persons, with a turnover of Lit. 175 million. Average growth from 1951 to 1961: 9.3 % per annum.

5. *Salt pans:*

Four salt pans, of which one "large". Number employed: 1 075 persons. Turnover: Lit. 10 500 million. Average growth from 1951 to 1961: 11.1 % per annum.

B. *MANUFACTURING*

I. FOOD, BEVERAGES AND TOBACCO

In 1961 these industries employed a total of 41 462. Out of 9 452 establishments, 70 were "large" and 151 "medium". Turnover was some Lit. 235 000 million. From 1951 to 1961 there was an average decline of 3.1 % per annum.

It must be pointed out in the past these industries played a considerably more important part in the economic structure of the region—a characteristic common to most developing areas.

The food manufacturing industries, in particular, employed about 28 000 persons and turnover was Lit. 178 000 million.

The most important of these industries were:

1. *Flour milling and pasta products:*

(11 400 employed, turnover of Lit. 90 000 million, 3 374 establishments).

2. *Vegetable oil:*

(11 000 employed, turnover of Lit. 63 000 million, 2 799 establishments).

3. *Confectionery:*

(153 establishments, 898 employed, turnover of Lit. 2 500 million).

4. *Canning and preserving:*

(Canning and preserving of meat, fish, fruit and vegetables, etc.) In 1961 this industry employed 3 263 persons, of whom 2 559 in the fruit and vegetable branch. Turnover was Lit. 10 500 million, Lit. 7 000 million of which for canning of fruit and vegetable products.

5. *Dairy produce industry:*

(1 308 employed, 244 establishments, turnover of Lit. 7 500 million).

6. *Miscellaneous:*

(Sugar and other foodstuffs: turnover some Lit. 4 000 million, 621 persons employed).

As has already been mentioned, these industries had a larger place in the past: the expansion since 1961 of certain other sectors, and particularly of other processing industries, has diminished the relative importance of these industries.

Growth prospects for the manufacture of pasta products and for the confectionery industry are modest, and in the latter are dependent on factors of a general nature, for example the price of cocoa.

The prospects are better in the canning industry, in particular the canning of fruit and vegetables, provided that the technical structures are improved and the natural advantages are exploited more rationally.

Prospects for growth in the dairy produce industry are for the most part conditioned by the livestock situation in the area.

The vegetable-oil industry needs thoroughly reorganizing. At present there seems no possibility of growth.

7. *Beverages and refrigeration:*

A distinction is made between the production of alcoholic beverages (wines, must, second category alcohol — e.g. obtained from wine, grape marc or fruit, spirits and liqueurs) and the non-alcoholic drinks industry.

In 1961 the alcoholic drinks industry had 1 932 establishments, employed 8 952 persons, with a turnover of Lit. 45 000 million. Most of the industry produced wines and must. The non-alcoholic drinks and refrigeration industry were on a smaller scale.

The growth prospects for wine production are good. An appreciable technical level has been reached as far as wine-growing is concerned. Effective measures have still to be taken to reorganize the industrial and distributive stages.

8. *Tobacco:*

In 1961 this industry employed 3 161 persons and had 383 establishments, of which 10 were "large" and "medium". Turnover was some Lit. 8 000 million. Growth prospects are dependent on government policy.

II. TEXTILES, CLOTHING AND LEATHER

In 1961 these industries employed 36 000 persons, with a turnover of Lit. 56 500 million. There were 17 600 establishments, of which only 17 "large" and 68 "medium".

There was a slow improvement from 1951 to 1961 and beyond. It took the form mainly of expansion of the larger establishments and the conversion of some others from craft to industrial dimensions.

1. *Textiles*

Turnover in 1961 was about Lit. 14 000 million. Out of a total of about 2 350 establishments, only 32 could be classified as "large" or "medium". About 7 000 persons were employed.

This group includes:

a) Cotton
b) Wool
c) Hard fibres
d) Miscellaneous

The miscellaneous branch was the largest in 1961, with 2 025 persons employed, 5 600 establishments, and a turnover of almost Lit. 10 000 million.

2. *Clothing*

These industries employed about 21 000 persons in 1961. There were 9 485 establishments, with a turnover of about Lit. 32 000 million.

The group covers:

a) Headgear
b) Garments
c) Linen
d) Upholstery and mattresses
e) Miscellaneous

By far the most important is the garments industry (over 8 000 establishments, 18 000 employed, turnover Lit. 27 000 million).

In this group, too, there are few "large" and "medium" establishments (26, of which 5 "large"), all in the province of Bari.

3. *Leather*

In 1961 the industry employed about 8 500 persons in 5 656 establishments, of which 17 "medium".

Turnover totalled Lit. 27 000 million. The industry fell into two main groups:

i) *Tanning, manufacture of leather goods*
ii) *Footwear*

The latter group is by far the more important (7 850 persons, 5 200 establishments, of which 17 "medium", and a turnover of over Lit. 9 000 million).

III. WOOD MANUFACTURES

The wood manufactures industry employed a total of 17 000 persons in 1961. There were 7 659 establishments, of which only 46 "large" (4) and "medium", and turnover totalled Lit. 32 000 million.

In general the industry showed a large increase in production but there were no important developments regarding structure or size.

It falls into two groups:

1. *Wood*

(6 319 establishments, 13 000 employed, turnover of about Lit. 25 000 million).

2. *Furniture*

(1 340 establishments, 4 125 employed, turnover some Lit. 6 000 million).

The forestry resources of the two regions (Apulia and Basilicata) are neither plentiful nor of high quality, for which reason these industries, in particular furniture, rely very much on imports. The possibility of growth is bound up with an increase of income in the Mezzogiorno, especially in the two regions.

IV. METAL MANUFACTURE

First it must be stressed that the 1961 statistics are only of relative value since they do not include the largest establishment in the area, Italsider's iron and steel complex in Taranto.

In 1961 there were 24 establishments, of which only 5 "large". Persons employed numbered 1 900 and turnover totalled Lit. 12 000 million.

The principal products were:
1. Steel ingots
2. Steel casting
3. Forged and hot-stamped items
4. Arc-welded pipes

On 15 October 1963 the first production unit of Italsider's fourth iron and steel centre began operations in Taranto.

In 1961 600 persons were employed and output planned was 200-300 000 tons per annum of pipes.

Once the steel complex is completed it will cover 5.4 million sq. m.; a total of Lit. 250 000 million will be invested.

In full swing the complex will have a production capacity of:

i) 2 250 000 tons of steel ingots
ii) 2 000 000 tons of iron

in sheets, strip and welded pipes of various gauges and diametres.

Apart from the Italsider project there have been the following developments since 1961:

i) Modernization of two large steel mills in Bari province;
ii) The Fucine Meridionali company which started operating in 1963;
iii) In Brindisi it is planned to open an establishment for the production of special pipes, with a production of up to 15 million metres in the first stage; about 400 persons will be employed and investments will total Lit. 2 000 million.

Other concerns, having a mainly craft structure, produce for the most part finished forged and stamped products. It may be said that, leaving aside Italsider, iron and steel production in Apulia and Basilicata satisfies local needs. The products are sold almost entirely to other parts of the Mezzogiorno.

While, on the one hand, the growth prospects of the metal manufacturing industry are bound up with the establishment of Italsider's fourth iron and steel centre, on the other hand smaller plants could benefit indirectly from the development of mechanical engineering industries.

V. MECHANICAL ENGINEERING

Mechanical engineering was of only minor importance in 1961 compared with its position in the centre and north of Italy. The industry employed about 28 000, the number of plants was 8 576, of which 17 "large" and 79 "medium", with a turnover of about Lit. 53 000 million.

1. *Mechanical engineering (non-electrical)*

In 1961 the industry employed some 3 500, the number of plants was 335, of which 8 "large" and 41 "medium", and turnover was some Lit. 9 000 million.

The main subdivisions are:

i) Foundries
ii) Industrial engines and lifting gear
iii) Machine tools and mechanical tools
iv) Industrial and agricultural machinery
v) Metal structures
vi) Precision engineering
vii) Miscellaneous.

The most important was the metal structures branch (mainly in the Taranto shipyards), where some 1 350 persons were employed. Turnover was about Lit. 3 500 million.

Another important branch was industrial and agricultural machinery (turnover of about Lit. 2 500 million) and foundries (turnover of Lit. 1 500 million).

2. *Electrical engineering*

This industry was on a very small scale in 1961 (320 employed, turnover of some Lit. 1 000 million, 21 plants, of which 4 "medium"). The main products were small accumulators, generators, components and accessories for the electrical equipment of motor vehicles.

A plant of some size is planned by the Breda-Bastogi group for the production of transformers and alternators.

The Breda company, in association with the Hupp company, is also completing a plant in the Bari industrial area for the production of refrigeration and air conditioning equipment.

Other new production lines are dynamo armatures at Potenza; radiological equipment at Acquaviva delle Fonti; washing machines at Lecce; refrigerators at Bari.

3. *Vehicles and shipbuilding*

The labour force here was some 7 000 persons in 1961, employed in 39 establishments, of which 7 "large" and 2 "medium". Turnover was just under Lit. 19 000 million.

The industry embraces:

i) Commercial vehicles, bodies, trailers
ii) Rolling stock for railways and tramways
iii) Aircraft and components
iv) Shipyards
v) Other vehicles.

Shipyards absorb the greater part of the labour force (almost 6 000 persons). Their turnover was about Lit. 14 500 million in 1961.

The second place is held by commercial vehicles, bodies and trailers, which employed over 800 and had a turnover of some Lit. 2 500 million.

4. *Workshops*

Some 8 000 establishments employed over 17 000 in 1961. They consist mainly of smithies (iron and tin), and repair shops for motor vehicles and motor cycles.

Regarding the mechanical engineering industry in general, the view is that over the period 1966-67 the following branches should be strengthened: metal structures, industrial and agricultural machinery, and railway rolling stock. The electrical machinery and precision instrument branches should be expanded subsequently.

The prospects for growth in mechanical engineering could improve if industrial integration on the pole were pursued more vigorously.

VI. PROCESSING OF NON-METALLIFEROUS MINERALS

In 1961 these industries employed 12 000 persons and had a turnover of Lit. 35 500 million. There were 1 145 plants, of which only 28 "large" and 83 "medium".

The most important activities were:

1. Working of marble, ornamental stone and building stone;
2. Production of cement, lime and plaster;
3. Brickworks;
4. Pottery, including stoneware and refractories;
5. Manufacture of cement and asbestos-cement products;
6. Glass;
7. Miscellaneous.

From the angle of turnover the most important branch was cement and asbestos-cement products (over Lit. 10 000 million).

Working of marble and production of cement, lime and plaster had a total turnover in 1961 of over Lit. 18 000 million. Most of the labour force was employed in manufacture of cement products, marble-working, brick-making and cement production.

Expansion of these industries was particularly rapid between 1951 and 1961, attaining an annual growth rate of 12 % in manpower and 19.2 % in added value. The highest increases, both of manpower and of added value, were in the manufacture of cement and asbestos-cement products.

The exceptional growth in the industries processing non-metalliferous minerals, in particular the building materials industry, is due to the sharp expansion of building, especially by the public authorities, from 1951 to 1961. This expansion led to increased demand for some products, particularly marble and ornamental and other stones, whose use has spread rapidly, not only in luxury construction but also in standard and low-cost building.

The growth prospects for these industries are good, in particular for the cement products industry.

VII. CHEMICALS, PETROCHEMICALS, RUBBER AND PAPER

First and foremost it must be pointed out that the 1961 figures for the chemical industry are out of date because of the large complexes which have been set up meanwhile.

In 1961 these industries as a whole employed about 4 500 and had a turnover of over Lit. 62 000 million. Among the 352 plants, 30 were "large" or "medium".

The industry has the following branches:

1. Chemicals proper;
2. Petroleum and coal derivatives;
3. Rubber;
4. Paper and paper products.

1. *Chemicals proper*

In 1961 the chemical industry employed a labour force of 1 631 and had a turnover of Lit. 9 000 million.

The industry consisted of the following lines:

a) Basic chemical products, derivatives, fertilizers;
b) Other chemical products (industrial gases, "second category" ethyl alcohol, pharmaceutical products, soap, etc.).

Since 1961 there has been very considerable investment in this branch, totalling some Lit. 280 000 million.

These investments have been mainly in Monteshell's large plant at Brindisi and 3 vinylchloride plants erected in the Basento Valley.

Once the Brindisi plant is completed (1966-67) it will cover an area of about 7 000 million sq. m. and will employ 4 000 persons. Investments worth some Lit. 150 000 million will be necessary. Output will be 600 000 metric tons, broken down as follows:

i) Chemicals and petrochemicals (320 000 tons);
ii) Plastics (200 000 tons);
iii) Elastomers and other intermediate products for the manufacture of rubber (40 000 tons).

2. *Petroleum and coal derivatives*

The ANIC petrochemical plant in the Basento Valley will, when completed, employ some 1 800. Investment planned will total Lit. 40 000 million.

By the chemical processing of natural gas the plant will produce annually:

i) 60 000 tons of synthetic methane;
ii) 30-35 000 tons of formaldehyde;
iii) 5 000 tons of acrylic resins;
iv) 6 000 tons of polyamide resins.

The Ceramica Pozzi petrochemical plant in the Basento Valley opened in August 1963 and will, on completion, produce mainly from natural gas:

i) 122 000 tons of oxygen;
ii) 45 000 tons of monomer vinylchloride;
iii) 40 000 tons of vinyl polymers and co-polymers.

Finally the Shell refinery at Taranto will process 4 million tons per annum of crude oil from the Middle East and North Africa; this capacity could if necessary be increased to 8 million tons. The refinery will cover an area of 1.5 million sq.m. and employ some 1 200 persons.

Planned annual production is as follows:

i) 500 000 tons of petrol;
ii) 1 700 000 tons of fuel oil;
iii) 400 000 tons of gas oil;
iv) 100 000 tons of paraffin, kerosene and jet fuel;
v) 100 000 tons of bitumen;
vi) 70 000 tons of liquified petroleum gas and various by-products.

3. *Rubber*

In 1961 there was only one plant, of medium size, which was equipped to vulcanize and retread motor tyres. A rubber footwear factory began to operate in 1963. The setting up of this establishment has doubled the added value of this branch, which in 1961 totalled Lit. 327 million.

An establishment for the production of insulated electric cables (Pirelli) is under construction, representing an initial investment of Lit. 3 000 million. Another factory (Breda and Dardanio Manulli group) is planned for the manufacture of motor tyres and inner tubes. The initial investment will total Lit. 4 500 million. Part of the raw material—synthetic rubber—will be produced by the Monteshell plants at Brindisi.

The labour force in this branch should reach 2 700.

4. *Paper and paper products*

In 1961 two medium sized plants were producing paper, pulp, board and wrapping paper. The paper products manufactured consisted mainly of boxes and packing cases, often produced on a craft scale.

In 1963 the added value in this industry totalled Lit. 1 900 million.

Two important projects of the Breda group are well under way: Cartiera Mediterranea (investment of over Lit. 6 000 million) and Italperga S.p.A. The branch has good prospects, and plans are on foot or contemplated to exploit them.

VIII. MISCELLANEOUS

These cover printing and publishing, photographic film and sound equipment, processing of plastics, etc. These industries as a whole represent 3 % in terms of employment and output.

The growth prospects for printing and publishing depend mainly on the general development of the Mezzogiorno's economy, on the availability of skilled labour and on a better organization of auxiliary technical services.

There are good prospects of expansion for the plastic processing.

C. *BUILDING AND CONSTRUCTION AND PLANT INSTALLATION*

In 1961 the industry accounted for 20 % of added value in Apulia and Basilicata and for 23 % of employment. In general the size of the labour force employed in 1961 was still rather high in relation to output.

1. *Building and construction*

The majority of establishments are small, employing less than 50 persons, and production in 1961 in terms of added value totalled Lit. 45 200 million. This part of the industry includes building and public works (85 % of added value in the industry) and auxiliary activities. In general there has been a slight levelling off of activity in the last few years.

2. *Installation of plant*

This branch accounted for just under 7 % of value added by the whole industry.

The prospects here, in conjunction with those of the building trade, are good.

D. *ELECTRICITY, GAS AND WATER*

In 1961 these three industries employed a total of 6 087 persons and had 491 establishments, of which 29 "large". Added value was some Lit. 17 500 million. The largest labour force was employed by water undertakings: over 3 000. The electricity industry employed about 2 600, with added value of over Lit. 11 000 million.

The gas industry was relatively of lesser importance, with some 300 employed and added value totalling Lit. 1 300 million.

At 31 December 1962 two hydro-generating electric stations and three thermal stations were under construction in Apulia and Basilicata. Three thermal stations had been put into service in the same year.

2.2. NATURAL RESOURCES

2.2.1. *MINERAL RESOURCES*

The mineral resources of the region add little to its industrial development potential.

The main products are:

i) Bauxite 290 000 metric tons p.a.;
ii) Bentonite 50 000 metric tons p.a.;
iii) Cement marl 70 000 metric tons p.a.;
iv) Bottled mineral water 20 000 metric tons p.a.

The biggest bauxite mine, S. Giovanni Rotondo, produced 250 000 tons in 1962. At the present rate of extraction this mine's reserves will probably last only a few years more. Another concession, the Cavone mine and its extensions, produced 40 000 tons in 1962; its reserves should last for 5-7 years. Other deposits have been explored, and reserves seem to total more than 20 million tons. Surveys are in progress to determine what part of the reserves may be considered profitable.

As regards hydrocarbons, the Basento Valley natural gas deposit being worked by AGIP has something of the order of 20 000 million cu.m. Small quantities of crude oil have been extracted experimentally from certain wells. Montecatini are developing another, smaller, deposit of some 150 million cu.m. of natural gas.

2.2.2. *WATER*

After recalling the fundamental characteristics of the local water sources, the report gives the annual water balance for Apulia and Basilicata (area 29 250 sq. kilometres):

	(millions of cu.m.)
— Precipitation	22 800
— Evaporation and transpiration	16 700
— Flow to the sea	6 100

These 6 100 million cu.m. constitue the "technical potential", i.e. the maximum water resources that can be exploited. Applying all the loss coefficients, this gives a technical potential of the order of 2 000 million cu.m. per annum—these are the resources that can be put to practical use. Resources already being utilized or earmarked for utilization account for 55 % of this total (1 160 million cu.m.); therefore another 850 million cu.m. per annum, or 27 cu.m. per second, can be put to further uses.

A comparison is then made between water supply and needs in the pole area, location being taken into account. Separate estimates are given for additional needs up to 1980 for drinking water, irrigation and industrial uses.

In adapting available resources to needs preference has been given to those of greatest utility. A point to note is that the water resources of the two regions far exceed the needs of the pole area.

For each solution examined an estimate is given of the total investment and of the cost of water for industrial purposes. The section concludes with a co-ordinated programme of the improvements necessary to satisfy the water needs of Bari, Taranto and Brindisi and their respective zones.

2.2.3. *AGRICULTURE*

The work presented in this section goes beyond the strict needs of a study for the promotion of an industrial pole; it was drawn up by Professor Rossi Doria and constitutes for agriculture a monograph similar to that on industry in sub-chapter 2.1.

The document is in two parts:

i) Description of the natural agricultural regions making up Apulia and Basilicata, outlining their problems and prospects;

ii) Analysis of the agricultural areas of the pole, that is, the areas directly influenced by industrial development, with the growth prospects of each branch of agriculture.

It concludes with forecasts of the trend of income and employment on the land, rationalization of employment of manpower and reform of farm structures.

In the two regions of Apulia and Basilicata there are, running from north-west to south-east, the following types of areas:

i) Mountainous areas (Basilicata, Alta Murgia, Gargano and Alta Daunia), which represent 30 % of the total, with a predominance of subsidiary forestry products (firewood, charcoal, railway sleepers) and pasture for goats and sheep, with subsistence crops, such as tree products of slight value. Net product per hectare cultivated and income per person working in agriculture are the lowest in Italy, which explains the high rate of drift from the land;

ii) Areas of extensive agriculture, which represent 30 % of the two regions, with a predominance of single-crop fields and agriculture based mainly on extensive wheat-growing (hilly interior of Basilicata, Fossa Premurgiana, Tavoliere); there is also a large-scale exodus from the areas of small peasant holdings, with the result that the land is being abandoned or turned over to extensive cultivation;

iii) Limited areas, on hilly and mountainous terrain in Basilicata, where mixed farming, once flourishing, survives on small, fragmented farms;

iv) Areas with specialized or intensive tree and vine growing, which cover a third of the pole and are characterized by the predominance of olive trees side by side with vines, almond trees and fruit trees, while crop cultivation declines more and more;

v) Areas newly irrigated, in particular Metaponto.

From 1951 to 1961 production increased by 14 % in the poor areas (hilly areas and those with extensive agriculture), which cover two thirds of Apulia and Basilicata, and by 50 % in the rich areas.

As regards the poor areas, the report recommends the reorganization of structure in the hilly areas by creating a forestry and pasture zone covering 500 000 hectares, the reorganization of farms from the angle of size, especially stock-raising farms, and the reorganization of population centres and services, development of communities and an active settlement and emigration policy. It is recommended that in the extensively cultivated areas, subject to the natural conditions, either a course of action be taken similar to that recommended for the hilly areas, or the land be converted to make it suitable for the highly mechanized growing of cereals on farms averaging 150 hectares and, if need be, managed by co-operatives.

In the pole area itself the most important tree crop is olives, followed by grapes, including dessert grapes; citrus fruits, in particular mandarins, are grown mainly along the Ionian coast, while other fruit-growing is very limited. Of the land cultivated 80 % is sown to broad beans and wheat, while vegetables are grown along the coast; there are small areas under sugar-beet, tobacco and flax. The pole area is one of the poorest in livestock in Italy, with one head of cattle to 20 hectares, the reason for which is the scanty supply of feeding-stuffs.

Out of 236 000 farms within the pole, 48 000 are of less than a half hectare, and of the rest 149 000 are under 5 hectares (an average of 1.8 hectares); these small and minute farms occupy one third of the cultivable area and on the best land. Family farms occupy 60 % of the total area; of these over 60 % are owner-occupied and 17 % of the land is rented; share-cropping hardly exists.

The problems in developing agriculture in the pole area differ entirely according to situation. In tree, vine and vegetable-growing areas, and in high or medium intensity tree crop areas, that is 60 % of the pole, development depends on improved adaptation of an already existing structure. In newly irrigated areas, the structure must undergo thoroughgoing changes in order to introduce intensive farming. Finally, in the extensive cereal-growing and pasture areas, agricultural development will depend on the trend or transformation of production structures in the light of current conditions.

The agricultural working population in the pole increased from 1931 to 1951 by some 46 %. This meant, because of the stagnation of production, widespread unemployment and underemployment and reduced income. From 1951 to 1961 migration from the land was very limited, the agricultural labour force decreasing by only 6 % while agriculture made considerable progress; consequently, the average income went down from 100 in 1931 to 80 in 1951 and up again to 112 by 1961.

However, the overall figures for the flight from the land conceal divergent trends: from 1951 to 1961 60 000 men left agriculture, but 60 % of them were replaced by women. Consequently the age pyramid has changed shape, its main characteristic now being the greater age of the working population, though this is less marked than in other regions.

As regards trend of the agricultural labour force, several different hypotheses have already been put forward on the basis of the movement of added value in agriculture:

a) On the assumption of an annual increase in added value of 2 %, in 1980 the gross product will be some Lit. 180 000 million. If the added value coefficients per unit of labour forecast by Fuà and Labini for 1978 are applied to these figures, it should be concluded that by then only 130 000 persons will be working in agriculture;

b) If added value equalled Lit. 1.2 million, i.e. an earned per capita income of Lit. 1 million, the agricultural labour force would number 148 000;

c) If added value equalled Lit. 750 000, it would correspond to an earned income of under Lit. 600 000 and the labour force could be as high as 237 000;

d) These figures are to be compared to that of 393 000 working in agriculture in 1961.

On farms specializing in tree crops, manpower utilization must be rationalized when old trees have to be replaced and the land is replanted more rationally; here there are possibilities in irrigated horticulture, on condition that as much of the work as possible is mechanized, that farms are enlarged or co-operation between them becomes general, and that irrigation is undertaken in a rational manner. The only solution for extensive agriculture seems to lie in considerably enlarging farms, which should be at least 150 or 200 hectares. The same principle of increased size also applies to stock-raising.

The report points out several times that the structure of farms is generally unsatisfactory and that thorough reform is called for. Particular stress is laid on the fact that agricultural wage-earners are probably most likely to follow in the footsteps of those who have already left the land and that the releasing of the land cultivated by them would allow it to be used for structural reform — a reform which is indispensable throughout the pole area, but less urgent and more localized in the newly irrigated area.

In conclusion the report estimates the time needed to bring about the changes needed to develop and reorganize agriculture. In view of the need for productive investment, of the inevitable slowness of profound structural changes and technological transformation, and also in view of the time-lag before the effects are felt, there seem to be valid grounds for considering that this development of agriculture can be attained only by 1979-81.

2.3. INFRASTRUCTURE FOR INDUSTRY

2.3.1. *TRANSPORT AND COMMUNICATIONS*

The description of transport infrastructures is particularly detailed. After general comments on the regional transport network and its links with the rest of Italy, the report goes in turn into road, rail, seaport and airport infrastructures.

Road links between the south of Italy and north-west Europe have been considerably improved of late with the opening of the motorway known as the "Autostrada del Sole", which runs from Milan to Naples via Bologna, Florence and Rome.

Furthermore, Apulia and Basilicata regions have a number of trunk roads which connect the various industrial areas and make it easier to reach the Tyrrhenian sea.

Finally, work is going ahead on improving and modernizing the national, provincial and communal road systems.

The bulk of goods traffic is between Apulia and Basilicata but a large volume also goes to Naples and Milan.

Like the roads, the railways follow the Adriatic and Tyrrhenian coastlines and are connected by cross-country lines. The network in the two regions is not running at full capacity and could cope with an increase in traffic, but the outdated structure of some parts of the network and the lack of a large marshalling centre in the two regions causes delays, and this is an obstacle, in particular to the transport of agricultural products to northern Italy and central Europe.

Out of 1 276 kilometres of State railways only 222 kilometres in the area are electrified. The ratio of track kilometres/sq. kilometres is 0.043 for the two regions of Apulia and Basilicata as against 0.054 for the whole of Italy.

The ports of the two regions are all in Apulia, which has 784 kilometres of coastline. Bari, Taranto and Brindisi are the main ports. Three secondary ports of some importance are: Manfredonia, which serves the largest bauxite mine in Italy; Barletta, from which salt from the Margherita di Savoia pans is shipped; and Molfetta, which is mainly a fishing port.

As regards air traffic, there are only the Bari and Brindisi airports.

An annex contains a miscellany of items: the history of transport in the area, from the age of Magna Graecia to the Italian Republic; technical details on motorways under construction; the present situation of financial assistance from the Cassa per il Mezzogiorno to improve the road system; information on the national trunk roads (including a longitudinal section of the main routes); the state of the provincial roads; the main features of the rail network (both state and other railways); a description of the three main ports and of the secondary ports; details on the region's airports; and, finally, data on public transport between towns by road and rail.

A sub-section on communications describes postal, telegraph and telephone services in the region.

2.3.2. *ENERGY*

After listing the energy resources of the Mezzogiorno, with particular reference to Apulia and Basilicata, the report discusses the production and distribution of electricity, the production and consumption of gas in urban areas, and the regional markets in solid and liquid fuels and in natural gas.

An annex shows:

i) The hydroelectric resources of southern Italy;
ii) The solid and liquid fuel reserves of southern Italy;
iii) The characteristics and trend of electricity consumption from 1951 to 1961;
iv) The electricity grid of southern Italy;
v) The distribution of electricity in the development pole;
vi) The characteristics and trend of gas consumption between 1951 and 1961 in towns in southern Italy and in the development pole;
vii) The current situation of town-gas works in Bari and Taranto;
viii) The availability and consumption of solid, liquid and gaseous fuels in southern Italy and the development pole — manufacturing plants;
ix) Overall energy consumption and regional balance sheets;
x) The price of the various fuels in the development pole.

The largest known sources of primary energy in the mainland part of the Mezzogiorno are:
a) Hydroelectric resources, which exist in all regions other than Apulia, but must be regarded as already largely exploited in view of the high cost of installing any further plants;
b) The lignite deposits at Mercure (Basilicata), which are to be worked very soon, to generate electricity only;
c) The natural gas deposit at Chieti in the Abruzzi, which is to be developed in the near future but will mainly supply towns in central Italy, particularly Rome;
d) The natural-gas deposit at Ferrandina, in Basilicata, development of which is imminent now that the pipelines serving Bari and Monopoli have been completed.

The electricity grid raises no problems.

Supplies of coal and liquid hydrocarbons present no problem at Bari, a well-equipped port with a refinery run jointly by AGIP and Standard Oil of New Jersey.

2.3.3. *WATER AND IMPROVEMENT OF WATER SUPPLY*

Section 2.2.1. described the general water situation of the area, suggesting the best ways of satisfying new needs, while here we are concerned with current utilization of water.

The drinking water installations are operated by the Apulia Water Board (Ente Autonomo Acquedotto Pugliese) with headquarters in Bari. They consist of four major systems: the Apulia, Basento, Agri and Caramola systems. They serve a total of 293 communes in the area; the other 87 are served by small independent local boards.

This section describes the installations and outlines their plans for extension in order to satisfy drinking water needs until the year 2 000.

Irrigation installations in the two regions cover an area of about 200 000 hectares and annual consumption is some 920 million cu.m.

After the second world war a programme of new installations was put in hand with considerable aid from the State, under the technical supervision of the Cassa per il Mezzogiorno. Its main objectives are the storage of water in various reservoirs and the tapping of underground water-bearing strata. Next comes a brief description of the situation as regards industrial consumption. Most of the numerous small and medium-sized works are supplied from the drinking water mains, the rest from ground water.

Solutions are then offered to the problems raised by the few industrial users making heavy demands on water supply; the users concerned are the Foggia paper-works, the Policoro sugar factory, the Malfi sugar factory and the Monteshell plant in Brindisi. The very heavy demands of the three Ferandina chemical plants and of the Italsider complex in Taranto are also discussed.

The last part discusses the protection of low-lying land against floods. Only one point directly affects the proposed development operations, but this comes under Part III; it is the protection of the Bari industrial estate.

2.3.4. *INDUSTRIAL ESTATES*

This describes separately the industrial estates at Bari, Taranto and Brindisi.

The report explains the reasons for choosing the location of the individual estates and their general features (climate, temperature, prevailing winds, soil, water table, and so on).

A description is also given of the composition of the industrial estates near the towns and of how they are divided into lots, available public services, transport possibilities and accessibility of the estates. There are studies on the same lines of estates near the satellite townships.

The Bari industrial estate covers an area of some 500 hectares, already partly occupied by new industries. Of the rest that is available but has not yet been allocated, 100 hectares are being equipped (a further

considerable extension is being bought). The local development authority sells the land at Lit. 1 400 per sq. metre fully equipped with electricity, natural gas, and drinking and industrial water mains, and with rail and road approaches to each lot.

Annexes give details on the availability and cost of electricity, fuel, industrial construction, and manpower in the industrial estates. Sketch-maps show the location of industrial estates near the main towns of the pole and of the present most important industries.

2.4. SOCIAL AND CULTURAL CAPITAL

This sub-chapter describes the basic social infrastructure of the area—housing, hospitals, health services, schools and recreation facilities.

2.4.1. *HOUSING*

The number of dwelling units in the three provinces of Bari, Taranto and Brindisi in 1961 was about 500 000—for a population of the order of 2 000 000. These figures show a considerable improvement on the previous census, since the number of units had increased over the intervening ten years at an average of 1.5 % per annum while population growth was only 0.6 % per annum.

Despite these improvements, the housing shortage is not yet remedied and in the infrastructure programme linked with the development pole a great deal of attention will have to be given to workers' housing.

2.4.2. *HOSPITALS AND HEALTH SERVICES*

Hospital facilities are still far from adequate. There are only six beds per thousand inhabitants, compared with eleven per thousand in the centre and the north of Italy. The WHO standard is ten per thousand.

2.4.3. *EDUCATION*

This section deals with the availability of educational establishments; there is a shortage at all levels—primary, secondary and university.

2.4.4. *RECREATION*

The region possesses 33 public libraries containing a total of 700 000 volumes; there are 49 people's libraries with 50 000 volumes, plus 511 reading rooms for adult education. The effectiveness of these institutions is very low: the people's libraries lend each of their books out once every three years on average.

The three museums in the area—at Bari, Taranto and Matera—had a total of 10 000 visitors in 1961, but most of these were passing tourists.

The region has no building used exclusively for theatrical or operatic performances. In 1961 there were 91 theatrical performances in local cinemas, with an average audience of 400-500. There are 500 cinemas, 24 of them in Bari and 19 in Taranto.

Four fifths of the population of Bari have radio sets and two fifths have television. The corresponding figures for Taranto and Brindisi are two thirds and one third.

There are very few sports grounds: 0.5 sq.m. per inhabitant compared with 80 sq.m. in Austria, 20 sq.m. in Britain and 2 sq.m. in central and northern Italy.

A table gives statistical information on hotels.

2.5. DIFFICULTY OF ATTRACTING BUSINESSMEN AND INDUSTRIAL EXECUTIVE STAFF

The difficulty of attracting businessmen and industrial executive staff is a recurrent factor in all developing areas and constitutes a problem in solving which a variety of factors come into play.

The difficulties which may arise differ according to whether the firms are "large" or "small" and "medium". Therefore the two types will be studied in turn.

Large enterprises

In general large industrial enterprises react favourably when confronted with the possibility of moving part of their establishment or creating new plants in areas where they do not usually operate, but which offer a larger supply of manpower and incentives of large returns from capital invested.

Since such areas are in the process of being industrialized it is not always easy to find executive staff on the spot with the necessary experience of the administrative, technical and productive systems characteristic of the type of establishment being set up. This difficulty is generally overcome by transferring part of the executive staff from headquarters without, however, weakening the central organization because the firm is large enough to spare the men.

As a rule staff are willing to be transferred to remote areas if a policy of incentives is adopted; these consist of more pay and better prospects of promotion, the extra cost to the firm being put at some 10.2 %.

Small and medium-sized enterprises

The smaller the size of the firm, the less economic incentive there is for the entrepreneur to invest in a developing area. Current fiscal and other advantages are considered insufficient by medium and small entrepreneurs to induce them to invest; but these advantages cannot be improved without the risk of placing too heavy a burden on public funds and of distorting competition.

It seems very unlikely that firms of this size can detach part of their executive staff without the risk of creating a critical situation. In the case of family firms there would be the added sacrifice of breaking up family circles.

Finally we must not underestimate the social obstacles due mainly to the natural resistance of the environment and differences in customs and habits, and so on, in the face of which the small or medium entrepreneur is at a greater disadvantage.

Conclusions

As has been seen, the transfer to the development pole of entrepreneurs and industrial executive staff, particularly those in small and medium-sized firms, certainly presents difficulties. Nevertheless, current experience suggest that a rapid transformation of the traditional mentality in the area and systematic steps taken by the State and local authorities and by the private sector, can eliminate many of the obstacles met with today.

CHAPTER 3

General criteria for establishing an industrial development pole

The first part of this study was devoted to an analysis of the human, natural and economic resources which can be mobilized for the purpose of speeding up the industrialization of the Bari-Taranto-Brindisi area, drawing attention to development potentials and opposing factors.

In the second part, we shall outline guiding principles for the establishment and promotion of a homogeneous industrial development pole in this area in accordance with the new approach to industrialization of peripheral regions of the EEC, which is being applied experimentally in the Mezzogiorno, in the area selected.

3.1. PRINCIPLES AND BASIS OF AN INDUSTRIALIZATION POLICY FOR THE MEZZOGIORNO

In discussing the principles and criteria for setting-up an industrial pole, it will be necessary to refer frequently to regional policy.

Discussion of a new approach and thus of the various aspects of industrialization policy in the Mezzogiorno and other peripheral regions of the EEC would be disjointed and difficult to understand unless preceded by a summary, however general, of the problem as a whole.

This summary is given in the following paragraphs, 3.1.1. and 3.1.2., and, for reasons of clear and logical presentation, its starting point is the necessity for industrialization.

3.1.1. *WHY THE MEZZOGIORNO MUST BE INDUSTRIALIZED TO ACHIEVE BALANCED ECONOMIC DEVELOPMENT IN ITALY AND IN THE EEC* (1)

The most developed regions of the EEC form a central block running from north-west to south-east, from the Netherlands to Northern Italy. The majority of the Community's industries are concentrated in these areas, comprising one-third of EEC territory; they have 45 % of the Community's population and produce about 60 % of its total output.

Highly concentrated production is accompanied by the highest population density in some of these areas, such as the Rhine-Ruhr, the Paris region and the Dutch "Randstad", and these areas are the strongest from the economic standpoint. On the other hand, within the same central block, there are zones which are now in decline as a result of changes in the market for their traditional products (coal etc.); there are also a number of "pockets" in which industrial activity is still limited for various reasons.

The other regions of the EEC are in general less developed the further they are from the central block. The low productive capacity of the peripheral regions is due to their relatively limited industrial activity and to the high percentage of the population working in agriculture; 55 % of population of the Community lives in these regions.

The "Zonenrandgebiete" of the Federal Republic of Germany form a special category amongst the peripheral regions; economic activity here has suffered severely from the division of the economic area on which they were based before the Second World War.

The economically weakest regions are, however, to be found in the Italian Mezzogiorno, with 18 million inhabitants, where conditions of typical under-development exist.

Per capita income, and hence the standard of living, in these peripheral regions diverge in a spectacular manner from those of the central areas. The Mezzogiorno is the extreme case with a per capita income only one-fifth that of the more developed regions such as the Rhine/Ruhr area etc., even if these extremes are disregarded, the difference still exceeds 2:1.

From the social point of view, it is intolerable that tens of millions of people living in the EEC, one of the richest parts of the world and certainly the most dynamic area in the West, should have such a low standard of living, without individual prospects, and with the further psychological drawback that people in Southern Italy are gradually becoming aware of the different conditions enjoyed by the population of more favoured areas of the Community. This awareness aggravates existing tensions and has political ramifications.

From the economic standpoint, the low productivity of populations in the "poor" regions has an adverse effect on the possible rate of development of the Community as a whole. This is due not only to the reduced contribution of these areas to total production, but also to the fact that the restricted purchasing power of the people living there limits possibilities for expanding production in the "rich" areas them-

(1) The initial statement of the regional problem in the EEC is based on introductory reports by Professor W. Hallstein and Professor R. Marjolin at the Conference on Regional Economies, Brussels, 1961; the subsequent discussion is original.

selves. Without in any way underestimating the inherent development factors of the rich regions and the prospects offered by continuous growth in trade between them and by their exports to countries outside the EEC, it is certain that an appreciable contribution could be provided by a sharp increase in demand such as would follow from an increase in incomes in the peripheral regions.

These considerations apply to an even greater extent at national level and particularly in the case of Italy, where the Mezzogiorno is such a major element, and the level of exports already reached by the North suggests that in the long term it will not be easy to maintain annual increases of the order of 12 % as in the decade 1950-60.

There can therefore be no doubt that for economic, social and political reasons, intensified growth of the per capita income of people living in the peripheral regions of the EEC, and specially in the Italian Mezzogiorno is desirable. Such an increase could be achieved by emigration to areas in the central block or by development of production in the peripheral regions. In the second case, at least in densely populated areas such as the Mezzogiorno and Western France, development of production means, substantially, industrialization: improvements to agricultural structures would result in a smaller agricultural labour force, whilst service occupations could not give full employment to a higher percentage of the population. (1)

The following arguments may be adduced in favour of industrialization of the peripheral regions:

a) reduction of the serious problems arising from the excessive concentration of economic activities and population already existing in certain of the more developed regions, involving more than proportionate increases in the cost of infrastructures and services and the serious social problems of runaway urban development; the avoidance of these problems in other regions where this phenomenon seems likely to occur;

b) prevention of the loss of social infrastructures, in particular living accommodation, which is abandoned as a result of emigration and in accordance with *a)* above, must frequently be provided at greater cost;

c) the avoidance of individual and collective problems arising from emigrants losing their social and cultural roots;

d) vast areas or entire regions will be saved from becoming depopulated or being left with only an ageing and impoverished population, resulting in their economic and social decline.

(1) In terms of direct occupation, a significant increase in tourism, especially if seasonal, could contribute only modestly to these regions. With particular reference to the Mezzogiorno, if there were a sharp increase in tourism, the considerable under-employment in various sectors of the service occupations might be absorbed.

It is a fact that in regions or areas where excessive concentration exists the increase in technical and social infrastructures required for the installation of further new industries and the consequent growth in population is becoming increasingly expensive. From the overall economic point of view, the more than proportionate increase in these costs constitutes a loss. In France, this has led to measures to restrain the influx of new industries to the Paris region.

If the sole choice within the Community lay between locating the new industries in the areas of excess concentration or in the peripheral areas, the latter solution would, generally speaking, be preferable. However there are other possibilities which are more advantageous.

Adjacent to and within the Paris region, the Rhine/Ruhr region and the Randstad, there are areas whose industrial concentration, although great, is still capable of considerable expansion. New industries in these areas can benefit immediately from external economies and other advantages similar to those of the regions of excess concentration. Indeed, there is an appreciable flow of new industrial investment into these regions and areas, with the "natural" growth of the large central and western European poles, forming a satisfactory alternative to political measures aimed at limiting the installation of new industries in regions of excessive concentration.

In these intermediate areas, there is not the problem of excess infrastructure costs. Instead, since the infrastructures are generally "additional", they are less expensive for the community than the "basic" infrastructures required in the outlying regions, or at least in those where development policy has not yet provided such infrastructures.

Thus the industrialization of the peripheral regions of the EEC is not the automatic solution for the problem of excessive geographical concentration of economic activity. New industries could be sited on the boundaries of these concentrations, e.g. up to 200 km from Paris in the extreme case of the Paris region. The problem can be solved within the central block by means of suitable town planning and geographical siting.

In the case of Italy similar arguments can be advanced concerning industrialization of the South, in order to avoid the future drawbacks of excessive concentration in the North; but if the problem is to be stated correctly, it should not be forgotten, that these situations are restricted to a few areas around the vertices of the Turin/Milan/Genoa industrial triangle.

Another similar argument in favour of the industrialization of the peripheral regions (although carrying less weight than the previous one) is the preservation of social infrastructures, such as existing houses, which would be abandoned if part of the population of these regions emigrated to more industrialized areas and would have to be replaced, as an additional charge, at greater cost in the receiving areas.

In actual fact, since it is impossible to carry out instant industrialization of the entire peripheral regions, and assuming, as one must, that industrialization can only take place progressively starting from a few initial concentrations (development poles) it follows that, except in a few places, this abandonment of social infrastructures will take place to a certain extent (1). As for the greater cost of social infrastructures in the receiving areas, this is true only of the regions of excessive concentration.

In the case of the Mezzogiorno it is probable that pole-type industrialization would take place in practice around some of the important urban centres of the South so that there would be still some loss of population from other centres, especially the smaller ones (2), which, of course, have never had much in the way of social infrastructures.

As regards the need to avoid the consequences of uprooting emigrants from their social and cultural background, it should be recognized that this is a social problem both for the emigrants and for the society which receives them, and that it can arise with migration within a single country as well as from one country to another.

However, this uprooting has two aspects for the emigrant: he has to live a long way from his home area and he has to exchange a rural environment for an urban and industrial environment. The latter is the more serious; even if the less-favoured regions are industrialized, such uprooting will present a problem in certain urban and industrial centres which will receive surplus population from rural areas (3).

Admittedly, a change of this kind presents less problems when it is within a single region or in neighbouring regions, but this is no reason in itself to opt for the alternative under examination (4). A more significant reason is avoidance of the harm caused by depopulation of the peripheral regions.

First of all it should be pointed out that there are cases in which this voluntary abandonment is most advantageous to the inhabitants and to the economy as a whole. This is the case in areas which, for topographical and other reasons (e.g. mountainous nature), are unsuitable for modern agriculture (except forestry etc.) and for any kind of industrialization whatever, e.g. many areas in the Italian Apennines. Similar conditions also prevail in certain areas of France and other countries of the EEC (5). Even in large regions, especially where there is imbalance between population and resources, emigration constitutes or has in the past — as in the Mezzogiorno — constituted a factor favouring the re-establishment of economic and social equilibrium.

There are, however, limits to emigration beyond which, instead of restoring the balance, it creates new and worse imbalances, causing a decline to set in in the region due to the exodus of the young and active part of the population. In the last few years symptoms of this phenomenon have begun to appear in the Mezzogiorno. It is, however, a fact that although there has been considerable emigration from most of the highly populated outlying regions during the last ten years, their overall population (6), owing to various demographic factors, has not fallen or has not shown any trend towards significant reduction. Indeed, in the Mezzogiorno over this period, although some two million persons have emigrated, representing a rate which could hardly be exceeded, the total population has nevertheless increased by 0.5 % per year. Although the setting-up of the Common Market and the consequent liberalization of movements of labour facilitate emigration, the level already reached may be considered to be close to the maximum. In view of the demographic trends, it can be assumed that, for the next ten years at least, the Mezzogiorno like the other peripheral regions, will maintain more or less its present population.

Industrialization of this part of the Community is therefore essential for social reasons also.

On the other hand the rapid increase in per capita income of this region will contribute significantly to the balanced expansion of the entire Community. It also follows that in these circumstances industrialization requires positive action by the authorities. It is inconceivable that regional divergences can in future be corrected automatically by market forces alone, if one of the fundamental assumptions concerning the mobility of the factors of production is not fulfilled.

(1) As will be seen in section 3.2.1, the apparently dispersed location of new industries is possible in certain areas of the central block. In fact, these units are based on relatively near industrial poles (that is to say, they are located in the sphere of economic influence of a pole) and can therefore operate competitively, whilst enjoying the advantages of the savings effected by concentration.

(2) Of course, for various reasons, (especially economic reasons regarding siting, etc.), factories may be erected outside these centres, but mostly the trend will be for erection within the poles.

(3) In such areas, scattered industrialization in country districts, although recommended by sociologists, is neither technically nor economically feasible, as we have seen.

(4) It is only this second aspect of uprooting which is referred to when it is stated that one of the factors contributing to the delimitation of social/economic regions is the possibility of workers moving without leaving their normal surroundings. In the Mezzogiorno such an area might, in general, be the province and more loosely, a region or group of regions having certain characteristics of its own, e.g. Apulia and Basilicata.

(5) These are areas with agricultural resources but affected by the problem of rural emigration. Clearly, this problem cannot be solved by industrialization but only by increasing the per capita income of the agricultural workers (reorganization of crops, modernization of production methods, reorganization of the market and, in particular, of the distribution of agricultural produce etc.) and raising their standard of living, by setting up modern rural centres with proper services, etc.

(6) This does not take account of migration from rural to urban areas within the large regions.

Further, the setting-up of the Common Market, with the elimination of customs barriers, represents a spur to competition and forces firms to increase their productive efficiency. This reinforces the trend to localize industrial investments in areas where there are external economies and not in the peripheral regions. The trend towards the development of trade between the already industrialized regions of the Community will continue; the less-favoured regions, where agriculture with its inelastic earnings predominates, will not automatically be able to increase their production and sales significantly despite the enlargement of the market.

In addition, there are new factors connected with the progress of technology and/or the availability of new resources and situations which open up possibilities for industrial development of the peripheral regions and these may modify the situation radically. New port facilities, supplies of iron ore, coal and oil from overseas, the discovery of natural gas etc. are leading in practice to the establishment of steelworks, refineries etc., and these do not necessarily result in the setting-up of a corresponding number of development poles. On the contrary, as will be shown in the following Section, technical progress has accelerated and is accelerating the economic development of the wealthy regions.

To sum up, if an active regional development policy is not pursued, the net result of the Common Market for the peripheral regions of the EEC could be more rapid development than in the past but this would still not be sufficient to bridge the gap between these regions and the central block which, as a result of the latter's further development, would be likely to widen.

Whilst regions adjacent to the most industrialized parts of the Community might benefit from the process of "natural" expansion now taking place, and encouraged by the setting-up of the Common Market, development of the peripheral regions can take place only if there is a vigorous and effective economic policy for these regions on a national and Community scale.

It should also be borne in mind that, whereas the promotion of industry is complementary to the improvement of agricultural structures in the thickly-populated outlying areas, industrialization, combined with increased agricultural production is the basic policy for densely-populated peripheral regions.

This policy must be far-reaching, in view of the large population concerned and the vast resources required. The costs thereby entailed for the community can be justified only if they are limited and temporary and if the policy leads to effective industrialization. In view of frequent and well-known failures in this field, criticisms are often expressed accusing regional policy of tampering with the machinery of a free economy, but these really represent fears that such a policy might result in the community's having to bear new burdens.

Thus, even though industrialization of the outlying areas of the EEC is essential on social grounds, such a policy will only be valid if the methods used are economically sound.

In the last analysis, a satisfactory policy of industrialization for such areas of the Community means that there must be suitable measures to set up industries which, after some initial concessions, will afterwards be able to compete with those of the more highly-industrialized areas. In other words, operating conditions similar to those enjoyed by industries in the central block of the EEC must be guaranteed.

As we have seen, this objective, which may appear ambitious and difficult to attain for under-developed countries, is both a necessity and a practical possibility for the peripheral regions of the Community. It is a necessity because the industries which are installed in these areas will not be protected by customs barriers but will only benefit from certain incentives; and it is feasible because they will form part of a large Common Market and will therefore not be restricted by those limits on size which are one of the principal obstacles to the technical and economic efficiency of industrial undertakings in the majority of under-developed countries.

For Italy and the Mezzogiorno, these economic principles should receive absolute priority in view of the extent of the problem in comparison with the national economy. In other words, the country cannot allow non-competitive industry to expand in the South, artificially and fundamentally supported out of public funds.

It will not be easy to implement a policy of industrialization capable of solving the problem of the Mezzogiorno, with limited means and many obstacles (restricted public finance, necessity of maintaining monetary stability etc.). However, there are a number of major factors favouring such a policy, especially the large available labour force, the favourable geographical situation for certain expanding markets and a good existing infrastructure etc. Above all, however, industrialization of the South can be a corner-stone of the economic development of the country over the next ten years and perhaps, given favourable circumstances, of a new Italian "economic miracle" after the years of recession and stagnation following the end of the first one.

3.1.2. *EXAMINATION OF SAVINGS OBTAINED THROUGH CONCENTRATION AND THE LIMITS TO THE POLICY OF INDUSTRIALIZATION FOR THE MEZZOGIORNO*

Industrialization policy for the Mezzogiorno uses the traditional instruments of regional policy employed in other countries of the EEC: fiscal concessions, outright grants, special financial terms, State holdings

in companies etc. for the new firms being set up in the South. One of the incentives is that goods and products required by government departments are ordered exclusively from industries in the Mezzogiorno. In addition there are significant contributions to the Consortia for the provision of infrastructures in the "industrial development areas", including the fitting-out of industrial sites to encourage industrial concentrations; similar contributions are granted to the "industrialization nuclei" to encourage smaller industrial concentrations ([1]). The industrialization policy was preceded and is being accompanied by schemes for the provision of general infrastructures, both technical and social.

For the purposes of the present study, an analysis of the individual methods and measures, problems of application etc. would have little relevance. The present system of incentives may be improved in quality, but it is more important to analyse the correctness of the line taken in the context of the conditions in which industrialization is taking place. Since there are certain similarities with problems and policies in other peripheral regions of the EEC, the analysis which follows may in certain respects also apply to these with the necessary modifications.

An overall examination shows that the fundamental aim of the present policy in the Mezzogiorno is to promote the emergence of industrial concentrations in certain areas with particular "vocations" where "external economies" will progressively have to be made available to the firms. These economies are one of the reasons why investment in the North is preferred at present. The object of these incentives would be to modify at least part of these preferences in favour of the new industrial centres.

Analysis of an industrialization policy with aims such as those described must commence by determining the effective content of the economies enjoyed by firms operating in the industrial concentrations in Northern Italy and central and western Europe in general and how these concentrations originated. The "industrial areas" of the Mezzogiorno must then be examined comparatively, together with the conditions prevailing there and their capacity for attracting a greater flow of investments.

From the historical point of view natural advantages (raw materials, navigable rivers etc.) and cultural factors favourable to innovation played a paramount role at the beginning of the industrial revolution in determining the location of industry in central and western Europe. In particular, with the transition from mobile and scattered iron smelting based on wood ([2]) to the use of coal (as fuel and a reducing agent) the iron and steel industry is now situated in a few areas on the coal seams which extend from the Saar and the Ruhr to the West as far as England, as a result of the large quantities of coal which the new processes consume and the high level of fixed investment required by them; these areas are favoured by the extent and the quality of the coal in them and at the same time have river transport facilities for the iron ore when there is none in the vicinity. For the same reasons (fuel), processing of the crude iron and steel takes place in the same areas; these areas also contain the industries which are the largest consumers of fuel, such as the glass and ceramics industries etc.

Other manufacturing industries which, right from the start of the industrial revolution were attracted by riverside sites (transport and hydraulic power) to small productive centres spread over a wide area (although even at that time they were more numerous in the large central western plains and valleys some of which include the coal seams mentioned), tended to expand first to the new iron smelting centres. The birth of the large iron and steel centres was in fact responsible for the concentrations of population and services where a large part of the manufacturing industry finds not only power at low cost but also a market and labour.

As regards northern Italy, where the industrial revolution was delayed, the original iron and steel poles were located in areas of dense population and existing small industries, based directly on the market and operating from the outset solely with imported coal and subsequently, in the twentieth century with electricity from hydro power stations (the main part of

([1]) See Section 1.1.2.

([2]) Before the industrial revolution economic activity in Europe was limited and spread over small productive centres. Industry was based on small, craft undertakings, sometimes with regional specialization in certain fields. There were some tendencies towards greater industrial activity in certain regions where there were more of these small productive centres, i.e. in the central-western European plains and valleys (Netherlands, northern France, Rhine Valley and Po Valley) as well as eastern and south-western England. Since industry was based mainly on manpower it arose mainly where groups of non-agricultural workers could exist economically (the productivity of labour was very low as the cost of transporting food was greater than that of the product and of the raw materials if they were not found locally). Industries therefore arose in regions such as those mentioned where owing to natural conditions there were fertile zones having a surplus of agricultural produce, combined with transport facilities (rivers, etc.) and sources of power (water-mills). Industry also arose in regions without surplus agricultural produce but with under-employment as a result of an excessive rise in population, labour being available cheaply on the spot (central France, eastern Bavaria, Scotland).
Iron smelting, at that time based on wood, was also widely scattered in small units mainly mobile in character and outside the general pattern of manufacturing activities described above, including processing of the crude iron. Since it was easier to transport the crude iron than the ore and since iron ore (as far as small deposits are concerned) is found all over the world and since woodland areas with water courses and other supplies of water for direct use, essential for the process of production, were numerous at that time, the units moved on after using up a small area of woodland in search of another nearby site where wood and water were available not far from the small surface deposits of ore.

the iron and steel industry is located on the Ligurian coast not only because it is easy to unload iron ore but also, and in particular, because of the market) ([1]).

Thus the basic and processing industries, orientated on the local market, were the main components of the initial concentrations which have become the largest centres of industry of today. In the last analysis, transport costs have been the most important factor in determining the location of industry within the pattern of European production deriving from the industrial revolution. During the nineteenth century and, to some extent, until the First World War, transport of raw materials, with the means of transport and the installations available at that time, were extremely costly, so that the price of coal and iron increased rapidly at a very short distance from the mines and the blast furnaces. For these reasons, the new iron and steel complexes grew up in big coalfields (the same applies to other industries already mentioned, as large consumers of fuel) and/or near to large deposits of iron ore while the engineering industry was established close to the iron and steelworks.

Despite technological innovations, especially in the twentieth century (including new sources and forms of energy) and despite development of the transport system, introducing more and more mobility into the elements and factors of production and hence possible diversification in the location of industry, there was in fact a tendency towards growing concentration of industry in these regions. The original poles expanded their spheres of influence and infrastructures were established linking centres of production. The process extended across these axes of development to adjacent regions, which benefited from the development.

Technical innovations and mass-production led to ever-increasing specialization of productive activities and hence of inter-industrial relations. The principal units were surrounded by auxiliary units, concerned with maintenance and overhaul of plant, machinery and equipment, as well as by subsidiary units (sub-contractors), industries producing other intermediate products and miscellaneous auxiliary services. New conditions for the subsequent development of these concentrations were created by this industrial integration, through which production costs were reduced and profits increased.

The first few decades of the present century really constitute a new phase in the industrial era. In the nineteenth century the processing industries were characterized by "vertical" production (the same factory would effect all processes leading to the finished product) whilst the more dynamic productive sectors moved steadily towards a horizontal structure. The production of each factory is concentrated on principal products, the rest being sub-contracted, with other specialized factories providing intermediate products to a vast clientele. This enables them to operate on a larger scale than would be possible for the client units and thus to employ more productive techniques, making better use of the means of production and manpower, with consequent lower costs.

This development in the structure of the processing industries has mainly concerned those with wide markets, "local" and basic industries being less affected.

The progress of transport and the world political and economic situation have opened up increasingly large markets on which there is increasing competition; it is this very competition, in its continuous drive towards greater productivity, which determines the future of industrial specialization. This drive is less evident with local, geographically protected industries (e.g. many food, drinks, furniture, building materials and other industries where the cost of transport is relatively high in comparison with the value of the product). The process of specialization in general is not taking place in many basic industries, sometimes because these are necessarily located near to certain natural resources well away from the industrial concentrations and sometimes because they are operating in large complexes in which rational vertical integration ensures high productivity both technically and economically (e.g. integrated cycle iron and steel centres).

Thus, modern industry, and particularly the most important processing industries, such as mechanical engineering now have a structure very different from that of the last century. There has been a transition from restricted industrial relationships to a system of vast and complex inter-relations. In terms of input/output these relationships have grown tremendously: the component lines (and columns), once consisting mainly of basic industries and those making finished products, today comprise mainly industries making intermediate products.

As is borne out by a recent study effected by the services of the Commission ([2]), the enormous increase in industrial production over the last fifty years was only rendered possible by more and more specialization.

In order to be competitive in the modern economy, a factory must be able to concentrate its efforts, especially in the technical field, on its principal activity and to turn for auxiliary and subsidiary services to specialized "sub-contractors" or miscellaneous sup-

([1]) In the United States the iron and steel industry arose in the Pittsburg area. Today half of this industry is still located on the coalfields simply because a large market has formed in this area; the other half, i.e. the "new" iron and steel industry is located in areas (representing a trend going back to the middle of the nineteenth century) where there are facilities for the transportation of coal and ore, or in particular where there is a large market and generally speaking the advantages of the large economic concentrations of Buffalo, Cleveland, Detroit, Chicago, etc.

([2]) Report by the services of the EEC Commission on the content and progress of the study entrusted to Italconsult.

pliers of goods and services. In many industries, manufacturers of finished products tend to maintain, apart from their commercial and administrative departments, only design and methods offices and assembly sections which assemble parts and units supplied to them by other intermediate industries. These in turn often handle only the fundamental processes in which they specialize, relying on other industries for the supply both of specific components and commercial, standardized products. In this way each industry can concentrate on a very restricted group of operations, with much lower production costs than would be the case for more diversified, though complementary activities.

The disadvantages of this specialization are that each firm is closely dependent on a wide range of other industries; this situation has come to be known under the general title of the "industrial environment". There is now a closely-knit market for raw materials and for products used in industry, such products being well defined as intermediate commercial and standardized goods, for which frequent contacts with the supplying industries are not necessary to ensure satisfactory supplies; but continuous contacts are essential with the subsidiary industries supplying suitably manufactured production "materials" and auxiliary industries (external maintenance and servicing of plant, machinery and equipment). If, therefore, a factory is to operate competitively, it must have in close proximity all the complementary "auxiliary" and "subsidiary" activities which are no longer handled by the firm itself for reasons of productivity. In addition, so that large and expensive stocks do not have to be held, they must be available in the vicinity from distributors of commercial, standardized products which comprise the inputs of the factory's production lines. Similar considerations apply to other industrial services such as technical offices etc.

On the other hand, no auxiliary or subsidiary unit or unit providing industrial services can succeed if it is to operate with a single client firm, whose demand is restricted and variable. The economic dimensions of these intermediate industrial units are such that they must have a considerable number of customer industries in order to operate satisfactorily, (their work is based on the very convenience of consolidating separate processing into a single line, thus permitting the use of more productive means, to full capacity, with the corresponding manpower). Similarly, it is not as a rule economically justifiable to accumulate a large stock of materials to satisfy the demands of a single factory.

It is plain that in the manufacturing sector under review, a firm cannot rationally plan the manufacture of a finished product except in a factory located in an industrial centre where all the intermediate goods and services for its sector are available. Similarly, a new auxiliary or subsidiary unit cannot be set up except in an existing, expanding industrial centre with a sufficient number of customer firms and other associated activities on which these units themselves depend. There is therefore a vicious circle which impedes the industrial development of non-industrialized regions.

To sum up, in the twentieth century the economies of concentration, taking the form of economies external to firms, came to be a basic factor in the localization of industry, whilst the locations of coal and iron ore deposits lost importance ([1]). For this reason, even though the original causes of the present geographical location of industry have disappeared, European industry tends to remain in the original regions of the central block ([2]).

The above analysis, summarizing the general results of the present study throws light on the basic reasons why, in outlying regions of the EEC, as in the Mezzogiorno, where a vigorous policy of development has been adopted, such a policy has been effective in attracting capital-intensive heavy industries and "local" industries (with predominantly vertical structu-

([1]) Since the Second World War it has become steadily less economic to work the European coal mines and it is increasingly necessary to import from the United States; the nearby iron ore deposits of Lorraine, etc. are now incapable of meeting the demands of iron and steel production.
It should be noted that the Lorraine iron and steel industry was originally based on the iron ore deposits, the coal being imported from the neighbouring Saarland and the northern French basin, except in the last few years when it has been imported from the United States.

([2]) This does not mean that advantages do not exist in setting up industries in other regions, e.g. the existence of raw materials, geographical position enabling supplies to be brought in by sea, availability of manpower, local markets etc. but the localization of investment, with a given market price, is governed by lowest costs (both of production and of distribution). In industry there are a large number of cost elements and so location depends on a multiplicity of factors. Nevertheless, with certain types of industry, it is sometimes the case that one cost prevails over the others. For example in the heavy industries (iron and steel, primary chemical, petrochemicals, refineries, etc.) the most important factor is the cost of transporting the fundamental raw materials, so that the industries tend to be located near deposits or on the coast close to ports; a number of others, such as certain food industries, are affected primarily by the high cost of the raw materials. In cases where transport costs are a significant factor, the tendency is to locate the industries concerned near their potential markets (cement manufacture, etc.). In addition, there is a wide range of activities made up of small and medium-size units, which for similar reasons are widely dispersed on local markets. For other industries, energy is the determining factor in location: these are established close to cheap and plentiful sources of energy (aluminium, electro-metallurgy, etc). It is, however, important to remember that today only a very small number of large and medium-sized industries are located having regard to a single factor only. In general, industries are located where a combination of cost elements offers advantages which outweigh the greater cost of certain single elements as compared with other possible sites. This is the case with locations based on the economy of concentration. Even when in regions of excessive concentration, certain "diseconomies" directly affect costs as a result of excess demand (higher land prices, rents, etc.), such a location will still be preferred if it offers firms a net advantage. This is the most frequent case.

res); conversely, it shows why such a policy has had scant success as regards the more dynamic sectors of the processing industries, especially in the sphere of mechanical engineering, whose development on the whole has been slow and disjointed.

If technical and economic conditions had remained as they were in the nineteenth century and at the beginning of this century, the establishment of these industries would probably have been sufficient to set off a process of "natural" and complete industrial development capable in itself of more or less matching the competitive portion of the large industrial centres of central western Europe. Unfortunately, however, these conditions have changed and the cumulative processes of industrial development are no longer exclusively quantitative, but are now also qualitative.

We have seen how technical innovations, in particular the introduction of mass-production with its corollary, specialization, involving complete reorganization of the structure of production (subsidiary industries etc.), have during the last few decades completely changed the form of economic development, so that the natural processes of adaptation of a linear economy are no longer effective. They now allow, and to some extent cause, widening gaps in the geographical location of production and incomes.

The rich countries and regions, favoured by the economies of concentration, possess and are developing the most dynamic processing industries, with ample prospective outlets on the international market; the under-developed countries and regions, apart from primary industries—which are often in structural difficulties—can rise only to a few basic industries and local activities, the latter being limited by low purchasing power in these areas. No large new centre of industry has been set up in the West, but those which existed prior to the First World War have been considerably diversified and extended.

The above contentions (which are borne out by the findings of the report) differ profoundly in a number of respects from previous studies of "external economies" in large industrial concentrations and development poles.

According to these studies, the economies of concentration in the highly-industrialized regions derive from:

i) a complete and efficient infrastructure;
ii) a large "local" market for products;
iii) an integrated labour market;
iv) a complex system of industrial interrelations.

The infrastructure is regarded as particularly important in the cumulative process of industrialization in such regions. Social infrastructures are just as important as technical infrastructures connected directly with economic activity, because the former determine the quality of the region's human potential, i.e. workers, skilled technicians and operators (general education and vocational training) and, to a significant extent, certain aspects of living conditions which will attract manpower (housing, hospitals, cultural and sporting facilities). The quality of the labour force in the central block is said to be favoured not only by adequate facilities for education and vocational training but also by an environment which has an industrial tradition and is enriched by the more go-ahead immigrants from other regions. In addition, the infrastructure of these regions is constantly improving: for it is precisely these industrial concentrations with their consequent economic and demographic concentrations which oblige States to develop them (pressure groups, tax revenue, etc.).

All this is fully recognized in this report, but, even though it is accepted that an infrastructure is a prerequisite of development and a necessary if not a sufficient condition for it, the provision of suitable infrastructures in certain peripheral areas of the EEC has not been followed by a process of industrial development; it is also emphasized that, precisely because of the high degree of concentration reached in some of the large centres of central western Europe, certain technical infrastructures (e.g. some types of transport) and social infrastructures (housing, etc.) are even regressing in qualitative terms, showing increased costs (not only in the public sector but also for users), without any tendency for the process of industrial accumulation to diminish.

There is no doubt that the big "local" market in the concentrations is a factor in the development of industry and of the economy in general, as opposed to the restricted market of the under-developed regions. It should, however, be pointed out that in the highly-industrialized regions most of the final production is in fact intended for "external" markets. External sales depend only to a very limited extent on transport facilities (the incidence of transport costs on the majority of products, especially finished products, is in fact quite small); they depend fundamentally on competitive production costs stimulated by industrial interrelationships. "Internal" demand consists mainly of intermediate demand from industries making finished products and depends directly on these relationships between industries.

In examining the economies of concentration, these studies place great emphasis on the advantages of the labour market. Firms are said to benefit from the availability of skilled labour and technicians as is demonstrated by the presence of other industries with similar products. This makes for flexibility in the use of labour, and workers and technicians have a choice of posts and prospects of promotion. The supply and demand for skilled manpower are duly taken into account in this report, even though the notion of availability is in fact highly relative in expanding regions where full employment is the rule and there are obvious pressures on the labour market. This is particularly so when we consider the problems facing firms erecting new large factories or important extensions to existing plant, rather than the current needs of various industries (turnover, etc.).

When a large new factory is to be set up in the peripheral regions, practically all of the skilled and semi-skilled workers have to be trained first, and a certain proportion has to be "imported" from more industrialized regions.

Even in the large concentrations, it is not always possible, in such cases, for all staff to be recruited directly and locally, and initial and further training has to be provided on a considerable scale. Although it costs more to obtain skilled labour in the peripheral regions and there are greater organizational difficulties, there is nevertheless a greater pool of general manpower, shortage of which severely restricts the rate of expansion in the large concentrations. When these aspects are analysed and compared, quoting figures as in this report, the conclusion must be that although there is a net advantage in having a skilled labour force available as opposed to having a large pool of general manpower, this advantage is not so great as to explain the lack of industrialization of the backward regions.

There has been little research into the system of industrial inter-relationships in the large concentrations. Those studies which are available are generally fragmentary; they may be valid for the purposes of macroeconomics but do not show the real structure of intermediate supply and demand in its technical and economic aspects.

Nevertheless, growing importance is being attributed to inter-industrial relationships as a factor in the economy of concentration; such relationships are considered in this report as the central feature of these concentrations, but due importance is attached to other factors, although in the final analysis, some are only corollaries of the first. The objective importance of these inter-relationships has obliged us from the outset to analyse their specific part in influencing the location of industries, varying from industry to industry.

For this purpose it appeared useful to distinguish and identify those industries whose location directly depends on technical/productional inter-relationships concerning inputs (those industries whose efficiency and competitiveness depends on the proximity of certain essential intermediate units). These have to be distinguished from industries whose location depends on inter-relationships from the marketing standpoint (sale of outputs to other industries, although this is not an essential input for the latter in the above sense). It is also necessary to identify those industries which are located in the concentrations for other reasons (general advantages of a local market or location of raw materials or other elements). For industries of the first type, it is next important to specify which elements of their inputs require the relative proximity of the corresponding intermediate industries for technical and economic reasons, expressed in terms of production and storage times and costs; it is also useful to specify the input elements for which such proximity is in fact insignificant.

This provides systematic information concerning the common reactions of individual firms to the proposal to set up a new industry in the Mezzogiorno. In addition to certain primary requirements (incentives, infrastructures etc.) a positive reply will frequently only be forthcoming if the proposed area can offer units capable of supplying certain essential finished and semi-finished components.

No studies were available giving precise and detailed information on these points, especially as regards determination of essential inputs in the above sense (1). This called for an *ad hoc* survey which, owing to its wide scope and the personnel and finance required went beyond our terms of reference. However, in view of its usefulness for future studies, Italconsult nevertheless decided to carry out such a survey (2).

In this report the findings of the survey are applied to large and medium mechanical engineering only in Chapter 4 and the feasibility studies. At this point we shall mention only certain features which have been noted concerning industrial inter-relationships and their influence on the location of industries, as well as certain relationships between principal and associated units.

The survey showed that those industries whose efficiency and competitiveness depend fundamentally on the proximity of numerous intermediate industries and which therefore tend to be located in industrial concentrations consist mainly of those in the broad mechanical-engineering sectors. There are other industries in which these relationships were significant in the choice of their location from the technical and productive standpoint. In the remaining industries, this influence is in general not very powerful and they tend to be located with a view to a market or other factors (e.g. raw materials) which may or may not coincide with an industrial concentration (in the former case it is clear that this will bring additional advantages).

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(1) The available matrices identify in sufficient detail only inputs (and outputs) with the highest value and/or weight. These are not necessarily identical with "essential" inputs in the sense that consuming industries and suppliers must be close to each other.

(2) A group of project engineers, economists and experts from various European countries were employed on this survey for about a year. The investigations covered about 150 major production lines of the processing industries, and the technical and economic structure of production at the most modern European factories in relation to input from primary, intermediate and especially auxiliary and subsidiary (sub-contracting) industries. Special attention was devoted to identifying inputs for which the supplying industries must be in close proximity. The distinction was made systematically and checked empirically on the basis of declarations made by factory owners interviewed. The specific dimensions and structure of the principal units were studied as well as the size and operating characteristics of the essential auxiliary and subsidiary units and their sphere of economic utilization.

In so far as it is permissible to generalize, industries can be classified on this basis in the following five groups (1):

Group 1 - Industries in the various mechanical engineering sectors, most of which require the proximity of numerous intermediate industries, especially auxiliary and subsidiary industries (sub-contractors). This necessity is a fundamental factor in the choice of an industrial concentration for their location (the centre of a pole or useful technical and economic range of the associated units). There is a certain similarity in the inputs of these industries, so that joint use is made of some types of intermediate units; the similarity is marked in the case of certain groups of industries which may in this sense be described as "homogeneous sectors" (heavy and medium mechanical engineering, electrical engineering, precision engineering, etc.). The corresponding intermediate units are located in the industrial concentrations not only for obvious reasons of demand for their finished and semi-finished products but also to meet the requirements of their complex technical inter-relationships.

Group 2 - Certain food industries such as canning, footwear industries etc., for which auxiliary and other intermediate units have to be nearby, but for which supplies of certain elements in their production are just as important, e.g. raw materials, specialized labour, etc. In practice, the result of these requirements is a tendency towards location in specialized concentrations near to such elements, and possessing the essential intermediate units. Natural textiles may be included in this group and man-made fibres to some extent.

Group 3 - Industries which do not require the proximity of intermediate units in order to operate normally as integrated wholes and/or owing to the nature of their production processes (in general the intermediate units required are restricted to auxiliary units carrying out repairs and maintenance to plant, etc.). These are industries whose location depends largely on raw materials or on supply facilities; oil refining, petrochemicals, basic chemical industry, etc. The large-scale iron and steel industries located on coasts, although influenced by the part of their market provided by the industries in Group 1, can be included in this group. Similar special locations taking precedence over limited technical inter-relationships are also found in industries in other sectors (paper and certain other food industries such as cooking oil, flour milling, sugar manufacture, etc.).

Group 4 - Industries consisting mainly of small and medium-sized units which have no great need to be in the vicinity of associated industries and which for various reasons (relatively high cost of transport in comparison with the value of the product or process, difficulties in distribution), are based on "local" markets: various types of food industries, beverages, wooden furniture, cement and building materials industries, repair shops, etc. These are industries which tend to be "dispersed".

Group 5 - The first sub-group consists of industries producing finished products which have no great need of technical and productive inter-relationships and whose products are intended for markets wider than merely local ones. Although there is some flexibility in the choice of sites for such industries, they tend to be located in large concentrations owing to the general and market advantages arising therefrom. The second sub-group consists of industries whose products satisfy the demand for intermediate products of many different industries; for these industries the attraction to concentrations derives specifically from inter-relations on the marketing side. Industries depending on the petro-chemical industry, such as the processing of rubber and plastics, the production of paints and detergents, etc. largely belong to the first sub-group as regards consumer products and to the second sub-group as regards intermediate products (2).

The relations between the principal customer units and intermediate units in the industrial concentrations are such that the latter operate with a high degree of competition and flexibility in the service of the former. This is because there are generally a large number of intermediate units of every category and type, satisfying particular dimensional requirements, which are in some cases considerable. As has already been suggested, these dimensions are attainable because of adequate demand from a large number of consumer industries (units producing the same or different products, but having common inputs).

Another fundamental point to emerge is that within the economic area of a concentration the radius of economic utilization of the intermediate units varies significantly among the different categories and types. Assuming an optimum transport and communications infrastructure, this radius may vary from a few dozen to a hundred km. Still in general terms, the auxiliary and subsidiary units have the most limited range. The former can only repair equipment, overhaul plant and machinery etc. on the premises of the principal units forming their clients if they are geographically close to them. The frequent contacts which are necessary between the principal units and their "sub-contractors" requires a certain proximity varying in accordance with the types of products, size of deliveries etc. Their radius of use is not limited by transport costs but by the customers' operational requirements e.g. direct inspection to check progress, and the quality of

(1) The industries mentioned in the individual groups are given as examples only; for the sake of brevity and clarity of exposition, various considerations which would be required in a complete and detailed analysis of industrial location are omitted.

(2) It should immediately be pointed out that although the industries in group 5 do not have large requirements as regards intermediate units, such requirements are not absent altogether. For example, a paint factory will require the relative proximity of a unit producing lettered metal cans and a detergent factory will require a unit producing cardboard boxes, etc.

the products sub-contracted, reduction of the risk of delay in delivery, which in practice can cause sharp increases in production and storage costs ([1]).

A complete and detailed analysis of these and other aspects of the inter-relationships will be given in Sections 4.1 and 4.2. Nevertheless, it is possible on the basis of the general ideas expressed so far to compare the infrastructures and industrial structures of the Mezzogiorno, in particular those of the "industrial development areas", with those of the North and in general of the more industrialized regions of the EEC.

It is obvious that the Mezzogiorno does not have an infrastructure comparable with that of the regions of the central block; nevertheless it is in a state of continual progress, especially in the "industrial areas". As regards technical infrastructures, the greatest drawback is, in general, transport and, in some areas, inadequate supplies of water. However, new motorways and fast roads are being built and the water problem is being solved; it should, however, be borne in mind that in many cases the shortage of water for industry is due to overestimates of the requirements of the industries which are to be set up. As regards social infrastructures, the greatest disadvantage is in the field of vocational training, although it should again be noted that in the industrial triangle of the North, this training is given by most large and medium-sized undertakings on the spot after school-leaving age ("apprentice" schools, training courses, etc.).

Structures in the Mezzogiorno are characterized, as in other peripheral regions in the EEC, and, in general, in underdeveloped economies, by poorly integrated industry consisting mainly of activities which enjoy a certain "geographical protection" or specific advantages of location. Some 80 % of the processing industries are of groups 4 and 3, which have no great need of inter-industrial relations in the aspects analysed above. Only a few industries in group 2, exclusively in the food sector, are of any importance, owing to particular supply conditions.

It is not coincidental that the great initiatives in the South have been effected in the field of oil refining, petrochemicals etc. Also, thanks to the direct initiative of the State, there is an iron and steel industry in Taranto, supplementing the pre-war one in Naples. In contrast to this, there have been no equivalent developments in the mechanical engineering sectors (Group 2) especially as regards private firms; there have been very few schemes of any size. The flow of investments into small and medium-sized units in these sectors has also been relatively insignificant. Similarly, certain food industries with wide markets have not expanded as had been expected on the basis of local resources of raw materials.

Disregarding the "dispersed" industries, whose expansion is limited by the size of local markets, which are limited in turn by the low per capita income, and disregarding the chemical and oil-refining industries, which have made tremendous progress, it would appear that the main obstacle to a greater flow of industrial investment to the Mezzogiorno can only be removed by setting up "industrial areas", offering the adequate inter-industrial relationships required by the more dynamic processing industries.

In this connection it should be remembered that a large part of the products of the mechanical engineering industry could, if obtained at competitive costs, be sold on external markets (the same applies to the products of certain large modern food industries, etc.) since there is a huge demand in Italy and in the entire Common Market, of which the Mezzogiorno forms a part. Transport costs have little effect on the majority of these products and the Mezzogiorno is favoured as regards markets in the Mediterranean basin. As regards labour, although it is difficult to find trained personnel and technicians in the Mezzogiorno and therefore higher costs are involved, on the other hand general labour costs less; for industries not requiring a high percentage of skilled workers, there would rather be advantages.

All doubt is dispelled if an analysis is made (see Chapter 2 above—Descriptive Section) which goes further than the number of employees and the value of the output, dealing also with the productive processes of the industries which most require such inter-relationships (Groups 1 and 2), especially in the various sectors of mechanical engineering.

The absence of essential auxiliary and subsidiary units and of industrial services (stocks of commercial and standardized industrial materials, etc.) means that the majority of such industries in the Mezzogiorno have to face high production costs and frequently inferior quality of the products. Many, indeed too many, intermediate products have or ought to come from central and northern Italy. As a result of the absence of auxiliary and subsidiary units, their work has to be carried out within the principal units themselves, on an insufficient scale with inadequate means which are not used to capacity ([2]) or else recourse is had to

([1]) For instance, in certain northern Italian industrial areas, many large principal engineering units prefer not to place orders with small sub-contracting units when they are more than 20 km from their factories. Delays in delivery or the discovery of defects on delivery in equipment or certain parts used in the principal product can make it necessary to alter production programmes, hold up production and assembly lines for several hours and create storage or sales problems, etc.

([2]) Certain large northern undertakings which have set up their own large factories in "industrial areas" in the Mezzogiorno have themselves been obliged to install sections inside the factory for all their repair and maintenance requirements for plant, machinery and equipment, since there are no auxiliary units in the areas concerned. Since the production of these factories varies considerably according to season, these sections have had to be designed for peak demand, so that the equipment and skilled manpower are not worked to capacity for a large part of the year.

other principal units whose structure is "vertical" (these units occasionally being used to supply products to other firms); otherwise recourse must be had to units in central and northern Italy (problems of inspection, delays and hold-ups in internal production). Essential industrial services also have to be provided directly or from central and northern Italy (1).

It should be emphasized that the problem is significant not only for its repercussions on existing industry (units recently installed and others already set up), but also because the absence of essential intermediate units brings to nothing the majority of the considerable opportunities for industrial investment which the Mezzogiorno could offer.

As a result of the low level of integration of industry in the Mezzogiorno, it is essential to give thought to the instruments of industrialization policy especially as the promotion of a geographical concentration of factories as has taken place to date does not necessarily result in the formation of adequate inter-industrial relations.

Although economic expansion is definitely a polarization phenomenon, i.e. it takes place at given points, or has done so since the industrial revolution, in dynamic economies inter-industrial relations determine industrial concentrations and not the other way round. In this case the concentrations are merely the geographical aspect of these inter-relations.

It is clear from the foregoing examination of the aspects and basic characteristics of industrial inter-relationships that the establishment of a few dozen manufacturing industries with different main production lines in proximity to each other does not result in significant inter-industrial relationships; a smaller number of principal industries with similar inputs could, however, create favourable conditions for the formation of some of the intermediate industries they must have (2).

In the Mezzogiorno, as for non-industrialized regions in general, a vicious circle is presented by the fact that the intermediate units must be of a certain size in order to operate economically while only relatively limited quantities of their products are absorbed by the individual principal units (including large units).

A new factory set up requires in principle such intermediate units to be within its area, but if these do not exist locally, they cannot come into existence for a single client and the factory being set up must have recourse to the inadequate solutions already mentioned ("vertical" structure, supplies from units in the North, etc.).

Although this problem applies to large-sized units too, there may be particular solutions to it in certain cases. A large new factory which is a branch of a northern firm can turn to a unit belonging to the same firm or to associated firms operating in the North for supplies of semi-products, finished parts etc., except for those needs which it must meet directly on a "vertical" basis. In this case, the greater cost can be cancelled out partly at least in the framework of the group by the fact that these supplies can contribute in short and medium term to keeping the supplying units operating at full capacity (3).

For some products it may be most economical for the factory, or group as a whole, for the factory in the South to be devoted entirely or mainly to assembly (with the advantage of using mainly unskilled labour which is available at lower cost than in the North, etc.). This does not of course contribute to industrial integration in the Mezzogiorno, but it is important to recognize that the economic and technical impossibility of integrating in the actual individual cases is, in fact, the root of the problem.

This problem tends to perpetuate itself; it is necessary to cover the cost of additional machinery, relations between northern and southern factories become established, and it is impossible for a single principal unit wishing to modify its productive organization to cause the necessary intermediate units to be set up on the basis of its own demand alone etc. Because of the existence of these negative factors, even when the number of factories in a given "industrial area" is increasing progressively, so that there are a number of principal units with similar inputs, these potentially favourable conditions do not in practice necessarily result in the setting-up of the intermediate units which are lacking.

This would appear to explain the phenomenon of poorly integrated industry in the Mezzogiorno, in certain peripheral regions of the EEC and in underdeveloped countries; this remains the case even after a certain laborious expansion due to incentives, protection etc.

(1) For example, the absence of specialized stocks of industrial materials means that there are two alternatives : to build up stocks inside large factories (the disadvantage of capital being tied up and interest), which would not have to be sustained by corresponding factories in the North or in other industrialized regions; or to run the risk, as is in practice frequently the case, of having to stop production and assembly lines, and to alter production programmes, etc. as a result of unforeseeable circumstances. The result is considerably increased production costs.

(2) It is realistic to consider only essential inputs, even if factories in highly industrialized regions can obtain practically all their inputs locally.

(3) It may be more advantageous to obtain supplies of semi-products from factories in the North belonging to the same company, for the reasons stated, even when an independent unit capable of supplying such semi-products at competitive prices is set up in the area of the factory in the South. This depends on the price difference and the mean unit and marginal cost curves, as well as transport costs. This, however, tends to be a short to medium-term phenomenon in an expanding economy. As the market expands and as the full productive capacity is brought into use, it may finally become more economic to obtain supplies locally.

This explains why the presence of certain "driving" units i.e. those which were expected, according to certain economic schools of thought which have had a wide following, to cause other industries to be set up have not in fact had this effect. (Two examples of this are the large iron and steel and petrochemical plants which have been set up in the "industrial areas").

Iron and steel plants, petrochemical works or large mechanical engineering factories are thus *not* "driving units" in the above sense.

Large iron and steel or petrochemical plants (see Group 3) are integrated internally rather than with outside units. On account of their dimensions, they may give rise to and sustain a number of intermediate units, but these are generally restricted to auxiliary maintenance and servicing (1). Sometimes such plants start with a limited number of production "cycles" (e.g. hot rolling in a steelworks or a chemical plant which is restricted to intermediate synthesized products); others are added later if market conditions are suitable (e.g. by the inclusion of cold rolling and the production of basic materials such as resins, etc. respectively). Especially in the case of petrochemical plants, this expansion, which often occurs in stages until the limits of the various cycles are reached, causes the original unit to be looked on as a "driving" unit, whereas in reality it is the beginning of a chain which if integrated (it need not necessarily be completed) has well-defined limits. (It does not matter whether various units making up a petrochemical complex, etc. belong to the same firm or are autonomous).

As for the "downstream" industries to which these complexes are supposed to give rise, such a mechanism does not in fact exist. There is now a tendency towards looser relations between basic and processing industries (2). The presence of a new iron and steel centre does not automatically give rise to new industries but only to isolated units such as cement manufacture from slag etc. As for the attraction of an iron and steelworks to mechanical engineering industries, we have seen these tend basically to be set up in areas where the intermediate and auxiliary industries indispensable to them already exist (3). Modern conditions of efficiency and competitiveness, as may be relied upon by industries in the vicinity of the necessary auxiliary and subsidiary units largely offset the additional cost of transport of iron and steel products (primary products) due to their being obtained from a distance of several hundred miles instead of locally.

In the case of industries "downstream" of a petrochemical works (except in special cases such as an associated lampblack unit) it should be borne in mind that the high cost of many of its products enlarges their range of influence to several hundred miles, since transport costs have little effect on the selling price of such products (4). Apart from a few exceptions, the siting of the consumer industries does not fundamentally depend on these primary products.

Furthermore, although the cost of transporting the final product has no great effect on the final cost (5), these industries, as already stated, tend to be sited in the large concentrations so as to benefit from the advantages of selling a considerable part of their output to industries and consumers on a wide local market (facilities for organization of distribution etc.), in addition to the advantage of the proximity of certain intermediate units.

It should be noted, however, that although such complexes cannot be considered as "driving" units, this does not mean that the setting-up of an iron and steel or petrochemical works in a given area will not have considerable effect (6).

Even if their output may predominently be intended for areas outside the region, such complexes can create industrial employment for thousands of people; if conditions favouring the siting of industries which consume their products also exist, their proximity is an additional advantage (punctual execution of orders, reduced storage costs, etc.).

In the main, not even large units which produce finished products and are characterized by a wide and diversified intermediate demand, e.g. large mechanical engineering factories, exercise a "driving" force in all cases. In this connection account should be taken of our previous remarks concerning the economic dimensions for the intermediaire units and the limited extent to which their products can be absorbed by a single factory, even if it is very large.

There are, of course, industrial units whose "intermediate" demand is highly diversified and also so great

(1) In practice, on account of the complexity of their plant and machinery, such complexes often handle all their own maintenance and servicing.

(2) A group of industrial experts of the EEC recently referred to this trend in the following terms : "... since the products of the basic industries are for the most part completely specific, technical contacts between the processing industries and the basic industries supplying them are less necessary; at most, the basic industries set up technical and commercial offices in the centres of the processing industries to promote sales".

(3) Empirical evidence of this is furnished, for instance, by the fact that no concentration of significant industrial units has arisen around the iron and steelworks established for a very long time at Terni and Piombino in central Italy.

(4) There are of course exceptions, such as solvents in the paint industry.

(5) In some cases, e.g. plastics, transport costs are a substantial item.

(6) The setting-up of an iron and steel works may be a vital necessity for an underdeveloped country having or wishing to establish fairly large mechanical engineering industries. In the Mezzogiorno too, the relative proximity of iron and steel works and the metallurgical industry in general to an industrial pole appears advantageous; nevertheless, a mechanical engineering industry can operate satisfactorily provided other more fundamental requirements are met, even if it is several hundred miles from the iron and steel works which supply it.

that they can alone absorb the entire output of intermediate and auxiliary units and, indeed, of more than one of the same type; for instance, a large factory working on a national and international scale on the production (not assembly) of motor vehicles and engines. But it is not possible to set up such factories in the Mezzogiorno and all the peripheral regions. Apart from a number of national economic considerations (market, etc.) it would be necessary to set up, simultaneously in Bari a large part of the industry existing at, for example, Turin; a progressive solution would clearly not be feasible because of the size of the units necessary for them to be competitive (1).

If we reassess the role of a number of large complexes set up in the "industrial areas" and recognize that in most cases the so-called "vocations" of the areas (port, etc.) merely constitute general possibilities also presented by a large number of other industrial locations, it will be understood that it is difficult to justify the size and characteristics of the large infrastructures envisaged in the town-planning schemes (derived from the direct requirements of these large complexes and certain others of a general nature). This difficulty is, however, in practice largely avoided by the fact that plans for executing the works carried out are approved in stages by the Ministerial Commission for the Mezzogiorno. Such approval is based on studies taking account of the actual economic and technical conditions in these "areas".

Despite the above remarks about the "driving" units, it is impossible to avoid the question why in some areas of the central block of the EEC, including northern Italy, the installation of large units characterized by their considerable "intermediate" industrial demand should to a certain extent result in the setting-up in the immediate vicinity of intermediate and auxiliary industries and industrial services. This would appear to confirm that "driving industries" do in fact exist.

A close examination of all aspects of the phenomenon, however, leads to a different conclusion. When a large unit is set up in the "empty" areas which are not densely industrialized within the central block—and there are still many of these—and adjacent regions, it will still be within the sphere of economic influence of one or more industrial poles, even if only marginally (geographical proximity is relative and can even extend to a hundred kilometres). The new unit, although among the industries requiring considerable technical and economic inter-relationships, is not obliged to organize on a "vertical" basis, as it can still find its essential intermediate units in the nearby pole or poles. Other units then follow this leader of "natural" expansion of this pole, gradually bringing about the local conditions of demand for and thus the establishment of auxiliary, subsidiary and other intermediate units and industrial services. More important in the creation of these conditions than the general influx of new factories is the attitude of the industrialists in attaching importance in their choice of location (in this case between the various leaders of development) to such factors as the indirect and future advantages of location in the vicinity of other factories, especially large ones, operating with similar techniques (similar inputs). In this way, a minor pole may arise from the original satellite nucleus of industrialization and later expand into a major industrial centre.

Even in this case it is difficult to identify the first industry which is set up with the "driving" unit from which a minor pole will develop; however, the conditions and environment of the industries to be set up in the Mezzogiorno, over 500 km from the poles of the North are very different.

One final important point must be examined, viz the relationship between incentives and inter-industrial relations. These incentives exist mainly to compensate for initial disadvantages. In fact, owing to the absence of a concrete integrated "milieu industriel" in the Mezzogiorno, these disadvantages largely tend to continue during the whole of the economic life of the factories.

In these circumstances, the incentives may be considered not only as initial assistance but also as elements compensating for operating results. For this purpose, it is necessary to express the various kinds of incentives (outright grants for fixed assets, reduced interest on loans, tax exemptions, etc.) in terms of an annual contribution expressed as a percentage of the market price of the product. This percentage, representing the marginal contribution to the competitive capacity of the various industries on the market may be roughly estimated for the majority of industries at some 2-5 % (2).

To what extent can such a contribution cover the extra costs due to the absence of the inter-industrial relations existing among the industries of the North and the other regions of the central block ? According to studies analysed in Chapter 4, costs may be more than 10 % higher in some cases, thus so far eating away at profit margins as to neutralize the effect of exemption from corporation tax in the Mezzogiorno. This clearly shows why the flow of private investment into industries in the South is so small.

Except for industries based on raw materials or local markets, or special cases, there is no reason why a private entrepreneur should deliberately take on organizational and operational difficulties in order to

(1) In an underdeveloped country with customs protection and a relatively large market—there are very few such countries—a progressive solution is possible; but the price of a car would be extremely high, thus penalizing both consumers and the economy and preventing any possibility of exports.

(2) A detailed examination of this factor is given in the reports.

obtain profits which would be at the most equal to those of a corresponding investment in the North.

The majority of private investment in the Mezzogiorno has in fact gone into industries located near to large deposits of raw materials, ports in favourable geographical positions and local markets. The question arises whether the majority of these industries would not have come into being anyway even without the complex system of incentives.

Again the role of the various incentives cannot be assessed in the case of private firms from the North which have set up factories in the South especially in order to benefit from large orders placed by the government and public enterprises exclusively with industries in the Mezzogiorno.

On the other hand, the inadequacy of the incentives in comparison with the disadvantages to be overcome by industries which, if their productive structures were different, would have great chances of development in the Mezzogiorno, e.g. the mechanical engineering industry, etc. (Groups 1 and 2), is greater for small and medium-sized private firms since large firms, as we have seen, can often provide advantageous solutions of their own.

The regrettable absence of modern small and medium-sized units in the process of industrialization of the Mezzogiorno, as far as these industries are concerned, is basically due to the above-mentioned absence of industrial inter-relationships both as regards "principal" units and, especially, intermediate units. These are the prime causes of this absence. The lack of business drive in the people of the South, the nature of the individual managements of small and medium-sized enterprises in the North, preventing the setting-up of branches in the South, credit difficulties, etc., may be contributing factors, but even if these did not exist—and they have been exaggerated—the same state of affairs would necessarily be evident in the prevailing circumstances in the Mezzogiorno.

This problem would not therefore necessarily be solved by a general increase in incentives.

For the groups and types of industries for which investment opportunities are at present scarce in the Mezzogiorno, improved incentives would provide a limited contribution to their competitive capacity and operating profits.

As for the possibility of "disincentives" so that industries in the North would channel part of these investments into the South, if these were efficient, their main effect would be to cause an influx into the Mezzogiorno of largely non-competitive industries, with consequently little hope of winning markets.

Such measures could harm the industry of the North —which is the foundation of the national income and Italian exports. It would be preferable to encourage reorganization and development in a few important sectors.

On the other hand, if the existing incentives for the "depressed areas" of the North, are not to work against the measures for industrializing the Mezzogiorno, they should be changed so that they take the form of town-planning and land organization schemes to avoid the unbalance due to excessive concentration. These schemes, taking account of the local problems mentioned, should channel the leaders of expansion in the large poles towards such of the areas in question as present the necessary requisites.

To conclude, the results of the policy for the South have been positive if not yet adequate. In the last ten years industrial investment in the Mezzogiorno has increased from 15 % of the national total to 25 %. In addition to expansion of industrial structures and the gradual improvement and completion of technical and social infrastructures, efforts have for the first time been made to break away from traditional economic and social patterns standing in the way of progress.

With the commencement of the second stage of the policy for industrializing the Mezzogiorno (the second period of the special legislation for the Mezzogiorno and the Cassa) the time would appear to have come to introduce new ways and means. A new approach in this direction is illustrated in the following section.

3.1.3. *A NEW APPROACH TO THE INDUSTRIALIZATION OF THE MEZZOGIORNO*

The aim of the present report is the setting-up of a development pole in the Mezzogiorno; it envisages measures based on a new approach to the policy for industrializing the Mezzogiorno. It is, therefore, essential to discuss this approach and to illustrate how it can be harmonized with the present directives of the Ministerial Commission for the Mezzogiorno so as to reinforce the existing instruments of economic policy. This is done in the present Section within the limits of the essential aspects necessary for understanding the general criteria governing the structure of the pole in question and the selection of the industrial units. These criteria are discussed further in Section 3.2. The competent government departments should examine these in detail.

Action must be concentrated above all, on the basis of the conclusions of Section 3.1.2, on industries whose expansion can be speeded up by modifying the conditions discussed in 3.1.2.

Vigorous efforts must be directed to the most dynamic processing industries.

The processing industries whose rate of expansion can be speeded up certainly do not include the industries in Group 4 which produce for "local" markets (these may also expand in time, but only concomitantly with the general process of development) or the industries in Group 3, such as oil-refining, petrochemicals, etc., whose location is based on deposits of raw materials

and/or favourable location for obtaining supplies for which the Mezzogiorno offers considerable advantages and in which there have been or are powerful "natural" trends towards expansion.

There is no reasonable possibility of accelerating the expansion of industries developing at different rates within the limits of their respective opportunities for investment. It is, in principle, sufficient to assist and support these industries by traditional means. On the other hand, the industries of Groups 1, 2 and part of Group 5 could, if these conditions were fulfilled, receive a stimulus which they have not hitherto had in the Mezzogiorno though they have wide potential markets and certain special advantages.

The largest number of unexploited possibilities exist without doubt in the numerous mechanical engineering sectors. There are also significant, if lesser possibilities in the modern canning industries, the industries "downstream" of petrochemical plants, including man-made fibres, and various other industries (1).

It is therefore in these groups of industries that the industrialization of the Mezzogiorno could be speeded up by the use of new instruments and approaches.

In the case of the mechanical engineering sectors (Group 1), it would specifically be necessary to encourage the establishment of inter-industrial relations, the absence of which today drastically restricts the opportunities for investment and is a cause of low efficiency, lack of competitiveness and restricted effective access to markets.

In view of the inter-relationships required by modern industry at the level of individual factories (relations of size between the intermediate and auxiliary units and the principal etc.), and the inertia holding back these industries in the Mezzogiorno (see Section 3.1.2.), the only way to break the vicious circle caused by the absence of industrial integration would be to set up, in these areas, "complexes" of principal industrial units using similar techniques (similar products or different products but with similar essential inputs) and the intermediate and auxiliary units necessary for them.

A "complex" would consist of a "homogeneous sector" (e.g. large and medium-scale mechanical engineering, the electro-mechanical sector, precision engineering) within which most of the essential intermediate and auxiliary units are common, as a result of the similar techniques used.

A "complex" would not consist of all the units covering the various products of the sector, but of a limited number of principal units, suitably selected, capable of maintaining by its own demand—including the demand of existing principal units, if any—an economic scale of production for at least one of each type of intermediate and auxiliary unit needed by the sector (2).

The work of the principal units of a "complex", (within the range of products of the homogeneous sector concerned), would be chosen on the basis of a number of general criteria, such as lack of necessity for a high proportion of skilled labour, non-duplication of specialized activities of central and northern Italy, etc. In order to limit the number of principal units to be promoted and to facilitate the achievement of the level of demand necessary to sustain the intermediate and auxiliary units—in some cases very high capacities are required—selection would be based on products manufactured in large factories having relatively high proportions of inputs obtained from the essential intermediate units in the sector. The "complex" would exclude principal units which were shown by feasibility studies not to have an adequate market or whose production costs were for various reasons higher than those of equivalent factories in the North, even in the new circumstances. Selection would thus take place in accordance with exclusively economic criteria. These criteria could be satisfied by the majority of the industries in the groups concerned if it is borne in mind that, in addition to the normal incentives, efforts would be made to eliminate the worst obstacle at present in the way of efficiency and competitiveness in the Mezzogiorno.

(1) Assuming manufacturing industries in the Mezzogiorno with roughly the same structure as in the North (although, of course, with different components within the various sectors, especially mechanical engineering), the percentages attained by the South in 1961, referred to population, would have been as follows :

Group 1	mechanical engineering	9
	(metallurgical)	(16)
Group 2	canning	106
	conventional textiles	10
	man-made fibres etc.	6
Group 3	petrochemical industry	80
	chemical industry	20
	oil, flour mills etc.	200
Group 4	machinery repair shops	50
	food other than canned food	43
	timber including furniture	55
	clothing, etc., other than shoes	54
	building materials, cement, etc.	59
	miscellaneous industries in the group	50
Group 5	miscellaneous industries "downstream" of the chemical industry	9
	other industries in the group	20

With all appropriate reservations, these figures bear out what has been maintained a number of times in the text. The industries in Group 4, mainly "local" industries, have attained the highest possible level in the regions where the per capita income is approximately 50-60 % of that in the North. The industries in Group 3, with "external" markets and located in the area of certain natural resources or supply facilities (except the chemical industry) are among the most developed. Despite potential "external" markets, the industries in Group 1 (mechanical engineering) and the larger industries in Group 2 (canning, if based on natural resources, and man-made fibres) have not developed, and the same applies to the industries in Group 5. Note that as regards the metallurgical sector the report disregards the Italsider complex, which commenced operation after the reference date.

(2) Henceforth in this document, the word "sector" shall also be taken to mean "sub-sector" unless otherwise stated.

Concerning the auxiliary, subsidiary and other intermediate units, it should be stressed that only essential units of this kind would be set up, i.e. those which for technical and economic reasons must be situated within the economic sphere of the principal units in the area, so that these principal units can enjoy conditions of production similar to those in more advanced regions. The "complex" would not include intermediate units which, although present for market reasons in the large industrial concentrations of such regions, do not as a whole offer the principal units significant advantages in terms of time and production and storage costs.

The establishment of the units and of a given "complex" would have to take place simultaneously. This condition would be fulfilled by direct promotion by a suitable body on the basis of commercial, technical and economic feasibility studies for the individual units forming the "complex" which would be made available to private entrepreneurs interested in investing in the Mezzogiorno.

These would be sound projects which could rely on a market and be certain of making a profit and it should therefore not be difficult to launch a "complex". Capital already earmarked by entrepreneurs for investment would be channelled into the Mezzogiorno instead of the North or other industrialized regions of the EEC. Wholly or partially State-owned undertakings could fill in any gaps left by private enterprise. In any case, such a "complex" should be flexibly planned, so that one or more principal industries can be replaced by undertakings on equivalent scale according to the preferences of the industrialists concerned.

In conclusion, direct promotion of a "complex", in addition to constituting in itself a considerable contribution to industrialization (the emergence of a number of technically and economically viable industrial units and the fact of offering already existing units a chance to operate more efficiently) would produce operating conditions similar to those in the North in a particular area and for a given homogeneous mechanical engineering sector, and this last factor is even more important. There would therefore be opportunities for subsequent investment in conditions which did not exist previously: presence of essential intermediate units (1), of local stocks of industrial materials, skilled labour, etc.

The homogeneous sectors and the corresponding "complexes" for the individual industrial areas would need to be selected in a coordinated manner over the entire Mezzogiorno. The general reasons for this are obvious, but there are special reasons which are due to the method of applying the proposed approach.

This selection would *inter alia* also have to be related to the demand of existing principal units in the "areas". In some of these areas there are signs of embryonic specialization associated with the presence of a number of principal units in one sector or sub-sector and—though, of course, their type and number are far from the minimum requirements—of certain intermediate units (e.g. in the Naples area, in certain fields of the electro-mechanical and large and medium-sized mechanical engineering industries). Since some of the intermediate units must be of considerable dimensions and capacities—so that they can only exist with a large number of customer industries—it would be reasonable in the first stage to restrict each area to the sector or sub-sector in which it specializes in order to reduce the number of principal (and intermediate) units to be set up.

Apart from its obvious advantages, some specialization of areas within the possible range of mechanical engineering industries is a necessity, particularly as in most cases when a "complex" is set up it would be possible in practice to meet the essential auxiliary and subsidiary requirements of a sector with a single unit of each type. The existence of a single auxiliary unit of each type will pose certain problems for consumer industries in the area as regards flexibility of supply (in the northern poles there is generally a number of intermediate units of any one type). The expansion of a given sector, and thus of its network of intermediate units, should therefore take place rapidly, and this is easier in the context of one or two areas than in the case of a sector dispersed over all the areas of the Mezzogiorno. This will also assist in preparing for the time when conditions in the "areas" enable the sector to develop independently on the basis of market forces. What we have said about the industries in Group 1 concerning the creation of "complexes", their direct promotion, and their coordination within the framework of the economic campaign in the Mezzogiorno etc. can be applied *mutatis mutandis* to homogeneous sectors of industries in Group 2. For certain sectors such as the canning industry, where embryonic specialized concentrations already exist in the Mezzogiorno, the "complex" to be set up could consist in practice of schemes for modernizing and expanding existing principal units and projects for intermediate units and essential industrial services, where these are now lacking and/or inadequate. Each "complex", suitably sited, would give rise to a specialized concentration, on which subsequent initiatives would be based.

A "new" sector in the Mezzogiorno is the spinning and weaving of man-made and mixed natural and man-made fibres. A textile "complex" would be located in areas next to petrochemical plants producing resins for man-made fibres, not so much owing to convenience of supply as to help in diversifying the activity in the area concerned. A textile "complex" in such areas, even if it needs fewer subsidiary units than in the case of the conventional textile

(1) The new intermediate and auxiliary units set up would have flexibility of production and prospects of expansion. New units of this kind would arise as the process continues.

industry, would create opportunities for new investments in that sector and in those of various supplying industries (1).

To sum up, intensive action in the case of the industries in Groups 1 and 2 would, on account of their nature, take the form of the direct promotion of "complexes" of projects, while for industries in Group 5 and similar industries, it would take the form of sponsoring individual projects for large and medium-scale industries, thus tending to locate in the new areas industries having a wide market, with a consequent broadening of the relationship between sectors in the Mezzogiorno (2).

A particularly interesting field is that of the industries "downstream" of the petrochemicals industry (manufacture of plastics, rubber, paint, detergents, etc.). The setting-up of "complexes" favouring the expansion of the mechanical engineering sectors could trigger off a considerable demand for thermo-setting and thermo-plastic materials, rubber goods and/or paint, etc. Taken together, the new industrial demand, the possibility of producing for consumption on the markets of the Mezzogiorno, the advantage, however small, in raw materials supply costs, the availability of auxiliary units, etc., are likely to create for industries "downstream" of the chemical and petrochemicals industries, conditions similar to those found in the industrial concentrations of the North.

In general, despite criteria laid down for specialization in such sectors or groups of sectors, and since the necessary conditions exist for the most important industrial areas of the Mezzogiorno, the aim should be to diversify the industries of each area, since such diversification is one of the characteristics of the large industrial concentrations.

Clearly, it would not be a question of reproducing on a smaller geographical scale the highly complicated structures of these large concentrations, but first of all of establishing in every area specific sectors of the industries of Groups 1, 2 and 3 and the related units of Group 3, which would form the technical and economic backbone of the area.

The basic technical and economic structure of each area would be made up of a complex of various homogeneous sectors and sub-sectors, suitably combined, in order to maximize inter-industrial relations, to set up an integrated labour market and to make the most efficient use of technical and social infrastructures. The industry of an area would consist of the industries forming its basic technical and economic structure and the "local" industries of Group 4 (and of course existing mines and building industries, etc.).

Finally, when laying down the basic structure of the industrial areas, it is important to take into account the consequences of the choice of location and the relationship with "agricultural poles" and "tourist poles". Plainly, the industrial structure of the individual areas cannot be determined only on the basis of rationalizing existing trends in these areas; there must be proper planning within the framework of the requirements of the general development policy for the Mezzogiorno and for the country as a whole.

The technical and economic structure of the poles would thus be determined on a co-ordinated basis for the whole of the Mezzogiorno within the framework of the national economy, and not only according to the resources and prospects of the individual areas. For such planning, it is essential with the new approach to the policy of industrialization of the Mezzogiorno, to put an end to the proliferation of areas and nuclei due to political and social pressures.

In view of the greater importance that certain areas would take on and of the economic sphere of influence they would command, there should not be more than four industrial poles in the Mezzogiorno. On the basis of the relatively large existing concentrations and other factors these would be: Caserta/Naples/Salerno (3); Bari/Taranto/Brindisi; Catania/Syracuse; Cagliari/Sassari.

As these poles expand they would give rise to a number of "satellite" industrial nuclei and/or industrial "strips" along certain "development axes".

In the rest of the Mezzogiorno, industrial development could successfully take place in not more than ten autonomous industrial nuclei (existing minor industrial areas and existing industrial nuclei which cannot be located in the sphere of economic influence of the poles mentioned above (4).

In the satellite nuclei, in addition to "local" industries, the technical and economic structure would clearly depend on that of their associated pole. In the autonomous nuclei, this structure would depend on industries such as the construction of machinery for the food industry, ship-building, structural engineering, electronics etc. and, if the right conditions existed, on a specialized Group 2 concentration (e.g. canning, etc.) or on certain industries of Group 3 (sugar,

(1) In addition to essential auxiliary units such as dye stuffs, there would be an advantage in having nearby intermediate units producing certain chemicals used as inputs by the principal spinning and weaving units (soap, sulphonates, lubricants, antistatic materials, etc.), quite apart from the need to maintain close technical collaboration between the producer and consumer units because new fibres are concerned.

(2) Although there are more inter-relationships within sectors, so that in certain groups of industries they are a decisive factor in the choice of location, there are nevertheless considerable inter-relationships between industries in different fields, with consequent advantages such as, in particular, a wide market, as is available in the large industrial concentrations.

(3) Considered as being linked with the Pomezia/Latina.

(4) At present there are 12 industrial development areas in the Mezzogiorno and 23 "industrialization nuclei". Apart from problems of nomenclature (the terminology used in this report is not important), it is plain that not all the existing "areas" could become "poles".

paper, etc.). Certain industries in Group 5 producing finished products and certain "local" industries could be encouraged towards the autonomous nuclei for greater diversification.

The establishment in the autonomous nuclei of the industries in Groups 1 and 2 could in principle be brought about by direct promotion of a corresponding group of projects (of course, on a smaller scale than the poles) the more important industries in Groups 3 and 5.

Although the sphere of influence of a pole (or a nucleus) varies according to its structure and a number of other factors and cannot be expressed unequivocally in terms of geographical space (it varies according to the factors dealt with), it is considered that if the "complexes" corresponding to these poles and nuclei are brought into being within a period of ten years, the industrialization policy would have substantial direct and indirect effects on about two-thirds of the effective economic area of the Mezzogiorno by the end of that period. This excludes mountain areas where no industrialization is possible in practice and, indeed, no modern-style agriculture: these areas are bound to become depopulated. There should be an official declaration to this effect based on existing data and forecasts, so as to allay fears that an industrialization policy on a pole basis might have no effect on most of the Mezzogiorno, but only on certain privileged areas.

To sum up, the new approach to the policy of industrializing the Mezzogiorno would introduce new features (concentrations based on inter-industrial relations and a more extensive role for the poles) and new instruments (co-ordination of the technical and economic structure of the poles and nuclei, direct promotion with feasibility reports for "complexes" of inter-related units); these new measures would be added to those already in force and enable the existing measures to bear full fruit.

As regards the instruments, the necessary direct incentives would continue as at present, but there might be certain improvements in composition and application. In principle, for simplicity of application and owing to the existence of special cases, it would be preferable not to introduce any differentiation in incentives according to location but simply to apply priorities in their practical application. The main encouragement to industrialists to make their free choices in accordance with the industrialization policy would be the operating conditions created by the existence of the "complexes" for the various sectors in the different locations. For instance, although the incentives may be identical, an industrialist wishing to set up a factory in the Mezzogiorno in a certain sector of the heavy mechanical engineering industry will logically choose the pole or one of the poles where the necessary auxiliary and subsidiary units exist. Promotion of the "complexes" and other projects would also have to be based on economic criteria established jointly with groups of expanding firms.

The new approach would entail the following measures:

a) an *ad hoc* study of production, productive structures and supplies of large and medium-scale factories in existence or under construction in the poles and autonomous nuclei, with special reference to the requirements and possibilities of industrial integration;
b) determination of the technical and economic structure of the poles and nuclei in relation to geographical aspects of the national economy and, in particular, of the Mezzogiorno;
c) determination of the "complexes" necessary for the integration and reinforcement of the sectors comprising these structures and drafting of feasibility reports for the principal, intermediate and auxiliary units constituting the "complexes" and individual projects for particular industries;
d) revision of infrastructure programmes in order to bring them into line with the technical and economic structures decided upon;
e) direct approach to industrialists to promote projects included in the "complexes" and the individual projects mentioned under *c)* on the basis of feasibility reports and normal incentives;
f) continuous subsequent promotion (information and persuasion), in order to direct new projects towards the poles and nuclei possessing suitable conditions and to consolidate their structure (continuous modernization of the industrial situation of the individual poles and nuclei is required);
g) reviewing of point *b)* at five-yearly intervals and consequent measures.

The present study is an experimental application of the new approach to the Bari/Taranto/Brindisi pole in connection with points *a), b), c)* and *d)*. If approved by the Ministerial Commission for the Mezzogiorno, the study should be implemented by means of suitable promotion, thus applying the new approach experimentally. The pilot programme will yield more detailed information as to the problems which have to be confronted (contacts with industrialists, role of the Consortia, etc.) and will make it possible to develop methods of decision and action.

To sum up, the new approach would be a means of speeding-up in a practical manner the industrialization of the Mezzogiorno, partly by the direct execution of projects, but mainly by creating an authentic productive environment similar to that of the more favoured regions of the North, and thus providing opportunities for subsequent investment, which would not otherwise have arisen. If existing firms and those which will be set up in the Mezzogiorno are assured of greater efficiency and competitiveness, the conditions will be created for wide outlets on the national and international market and, by means of a network of industrial inter-relationships, for expansion of the local market. This would counteract the absence of small and medium-sized industries which constitute a considerable part of the auxiliary and subsidiary units which would be directly and indirectly promot-

ed; it would also solve problems of operation for small and medium-sized industries producing finished products which, with their existing structure, are operating at a disavantage as compared with large-sized units.

These benefits for the economy as a whole would be achieved at relatively low cost and without the necessity of introducing compulsory measures affecting industrialists. In a climate of economic freedom and potential cooperation, the latter would be offered new and advantageous opportunities for investment.

Finally, the new approach would provide the fundamental concrete elements for the infrastructure programmes in the industrial areas and nuclei and for regional planning of the industrial section of the national plan.

3.2. DETERMINATION OF THE STRUCTURE OF THE BARI/TARANTO/BRINDISI POLE AND GENERAL CRITERIA FOR THE SELECTION OF UNITS

Bari/Taranto/Brindisi was chosen for the application of the present experimental study with the approval of the EEC Commission and the Ministerial Commission for the Mezzogiorno, on account of the experimental nature of the work.

The Caserta/Naples/Salerno pole was not chosen, so as not to confuse the effects of the new approach with those of an existing relatively advanced process; Catania/Syracuse was rejected because of its special character (petrochemicals industry) and because important development surveys were already in progress providing for changes in structure and infrastructure; the Cagliari/Sassari pole was not chosen because development was in a preliminary stage and studies and plans were already in hand.

In Section 3.2.1 the structure of the Bari/Taranto/Brindisi pole is determined on the basis of the principles and general criteria established above. Co-ordination with the other poles and the more important nuclei was effected without it being possible to refer to all the *ad hoc* information necessary as provided in 3.1.3, but the information available was supplemented from various sources (Ministerial Commission, Cassa, Isveimer, etc.) and with data obtained from direct surveys including a major one covering the important industries in the Naples pole. This procedure is satisfactory only for experimental purposes and would have to be improved and perfected if it were to be generally applied in the Mezzogiorno. Section 3.2.2. sets out the general criteria to be applied in Chapter 4 concerning the selection of industrial units for subsequent planning.

3.2.1. *DETERMINATION OF THE STRUCTURE OF THE POLE*

Determination of the basic technical and economic structure of the Bari/Taranto/Brindisi pole is based on an analysis of the economic resources of the area in relation to the industries in Groups 1, 2 and 3 and associated industries in Group 5, taking into account other resources and factors (both positive and negative) of development within the general framework of the economy of the Mezzogiorno and in particular of that of the other industrial poles and nuclei.

The descriptive section of Chapter 2 of this report reveals the following essential aspects of the pole's existing industry ([1]):

i) relatively concentrated metallurgical and mechanical engineering industries, the latter poorly integrated, comprising the largest industrial concentration in this field in the Mezzogiorno after that of the Caserta/Naples/Salerno pole.

ii) Some small canning firms which nevertheless have high potential advantages as regards the supply of raw materials.

iii) the largest oil and wine-producing industries in Italy; there are also other food industries, but there are serious obstacles in the way of their development;

iv) an important petrochemicals industry on a European scale; none of the associated "downstream" industries;

v) some considerable industries in certain clothing fields (ready-made clothing), a large paper mill and various other industries which also produce for the "external" market;

vi) a large number of significant "local" industries.

In particular, Italsider's integral cycle steelworks has just been opened in Taranto. It is the most modern in Italy (2 500 000 metric tons of steel and 2 000 000

([1]) Chapter 2 of part one contains an extensive description and evaluation of the existing industry of the pole and of its possibilities and prospects. However, it should be noted that the terminology used in relation to the dimensions of factories has been changed in the present Section; in Chapter 2, the classes "large", "medium" and "small" were on the scale of the Mezzogiorno, but here, since it will eventually be necessary to plan principal units on a national and European scale, these classes should now be understood as referring to this scale. Similarly the term "sector" is here used in the wider sense of "homogeneous sector".

metric tons of pig-iron) (1). At present only hot-rolling is carried out; cold-rolling facilities will be added later. The pole also has two medium-sized steelworks and a small to medium-sized steelworks for special steels is projected. In addition to Italsider's welded tube section (2), a medium-sized factory for the construction of special steel tubes for the refrigeration industry is under construction.

In 1963, 23 000 persons were employed in mechanical engineering, including 6 000 at shipyards, 8 000 in various medium-scale activities and 9 000 in small mechanical repair shops. There is an almost total absence of auxiliary and subsidiary industries in this sector (as far as auxiliary units are concerned, there are only a few units maintaining plant other than motor vehicles—these are made up of some of the mechanical engineering workshops among the subsidiaries of the foundry and forging units which, if they were suitably organized, could function as specialized intermediate units).

In addition to shipbuilding, the following branches of large and medium-scale mechanical engineering have some importance: Structural steel work (especially lightweight), assembly of special equipment and conversion of commercial vehicles; less important is the construction of machines for the food industry, and for the extraction and treatment of ores and boiler-making.

Two large developments by Breda-ENI have recently been set up in the pole: Fucine Meridionali producing equipment for the extraction, distribution and refining of hydrocarbons and for miscellaneous industries (3); and Pignone-Sud, with an industrial cocks and valves section, especially for the oil industry, and a section producing pneumatic, electric and electronic measuring and control instruments for instrumentation and automation.

In addition, Breda, in association with other groups, has various projects, amongst the most important being: BRIF for the construction of high-power diesel engines, motor cultivators and gear-wheels; Ferrosud for the construction of railway equipment and trolley-bus equipment (4); Ferromeccanica Meridionale for the construction of boilers and tubular sections; MECA, a medium-sized unit producing insulated electric cables. Other firms have projects for a medium-sized structural steel unit and various small to medium-sized units for structural steel, boilers, agricultural and building machinery.

There is no factory of any importance in the electromechanical sector in the pole; Breda-Insud is reported to have a project at the study stage for a unit to construct transformers, alternators, thermo-alternators and electric motors.

Pignone-Sud introduced precision engineering to the pole; there appear to be no further projects in this field.

The absence of electrical engineering from the pole, the fact that the few projects in this field are still at the study stage and that electrical engineering units exist already on a large scale in the Caserta/Naples/Salerno pole—though with serious problems of integration— suggest that this sector might be excluded from the basic structure of the Bari/Taranto/Brindisi pole. Similarly, electronics should be excluded, as it is specialized in the Campania pole and in Latina/Pomezia.

The basic structure of the pole as regards the industries of Group 1 would thus be founded on the large and medium-scale mechanical engineering sectors and precision engineering. However, the development of the precision instruments industry requires highly skilled labour which does not exist in the pole and whose training would be long and difficult. One possibility would however be to expand the large and medium-scale mechanical engineering sector, from which workers could be selected for training in precision engineering.

These limits also apply to the auxiliary and subsidiary units. The precision instruments industry, although using many of the essential intermediate units jointly with the large and medium-scale mechanical engineering sector, requires in addition special types of subsidiary units employing specialized manpower.

From various points of view, the expansion of large and medium-scale mechanical engineering appears to be a prerequisite for the expansion of precision engineering. It follows that for the Group 1 industries, with precision instruments still being considered as part of the basic structure of the pole, direct development should concentrate first on large and medium mechanical engineering. In this large homogeneous sector, there would on the whole be wide prospects of gaining a national and an international market; here the principal and necessary associated units comprising a "complex" can be selected.

As for Group 2, the pole already has 200 canning units, of which only about 10 are on an industrial scale; most of them can fruit, especially tomatoes. They are organized "vertically" without the support of the necessary intermediate and auxiliary units or of essential industrial services. There are very large potential local resources of raw materials: the climate and the land are particularly favourable for a wide range of vegetables and fruit; the nearby land-improvement area of the Metaponto will, when development is complete, have about 40 000 ha under irrigation. This sector may therefore be included in the basic structure of the pole (5).

(1) Potential output 6 000 000 metric tons of steel.
(2) In operation since 1961.
(3) The plant also has foundries and forges.
(4) This project may be put in hand on the edge of the area of the pole (provinces of Bari and Matera).

(5) In addition to more organized expansion of the conventional canning sector, there are considerable prospects for deep-freezing fruit, chickens, etc. There might also be interesting prospects for canning shellfish and crustaceans.

Although other food industries, such as the oil and wine-producing industry, may be of national importance, they have limited possibilities of expansion—apart from radical rationalization and extension of productive cycles—imposed by the supply of agricultural products at suitable prices, and these limits will probably not tend to change in future. The flour-milling industry faces similar limits.

The spinning industry does not exist in the pole. Weaving is represented by a small to medium-sized cotton mill and hemp mill and another unit, of similar size, is under construction for the weaving of yarn made from man-made fibres and mixed man-made and natural fibres. Knitwear, on the other hand, excluding handicraft firms, is represented by about ten units employing some 2 000 persons.

In view of the large supply of female labour, reasons connected with integration of the labour market and the diversification of activities necessary in certain areas, there is no reason why the man-made fibres and mixed man-made and natural fibres spinning and weaving industry should be excluded from the basic structure of the pole, provided that certain conditions are satisfied (1).

As for markets, there is a strong and increasing demand for synthetic yarns on both Italian and foreign markets, which would be added to the already considerable local demand from knitwear firms.

Except for synthetic textiles, no possibilities have in general emerged for other Group 2 industries in the area.

Group 3 is dominated in the pole by the Monteshell-Polymer chemical works at Brindisi (having a total output of some 700 thousand metric tons of chemicals and petrochemical products, including a wide range of intermediate products for industries "downstream" of the petrochemicals industry). In addition the region also includes two other large petrochemical works between Ferrandina and Pisticci, part of whose products are similar. In addition, there is in Bari the conventional Stanic refinery (capable of processing 2 500 000 metric tons of crude oil) and another refinery is planned by Shell for Taranto (capacity 4 000 000 metric tons). The paper industry has recently gained a foothold in the pole in the shape of the two mills set up by Breda in association with another firm.

As we have said, there are practically no industries "downstream" of the petrochemicals industry, but Breda has plans for a unit named Brema to produce tyres and inner tubes; there is also the Meca project already mentioned, for the manufacture of rubber insulation for electric cables.

On account of the importance of petrochemicals industry in Brindisi, it is useful for the purposes of zonal diversification and extension of industrial inter-relationships over the entire area of the pole to consider the industries "downstream" of the Brindisi plant as part of the basic technical and economic structure (as well as the spinning and weaving of man-made and mixed fibres, already mentioned, and the processing of rubber, plastics, paints and dye-stuffs, detergents, etc.).

To sum up, the basic technical and economic structure of the Bari/Taranto/Brindisi pole would consist of:

a) a large-scale steel industry and miscellaneous metallurgical industries;
b) large and medium-scale mechanical engineering;
c) precision instruments;
d) canning, etc.;
e) the petrochemicals industry and refining;
f) synthetic and mixed synthetic/natural textiles;
g) various intermediate processing units "downstream" of the petrochemicals industry.

Since sectors *a), e)* and *c)*—the latter could only be developed in a subsequent stage—are already present, studies would have to be made for the corresponding "complexes" and projects for sectors *b), d), f)* and *g).*

However, in view of the advantage of concentrating research work in a single sector which is obviously the most important one as regards prospects for expanding both production and employment in the pole, the EEC Commission decided to ask Italconsult to study only the large and medium-scale mechanical engineering sector.

The remaining chapters of this report will therefore be exclusively devoted to specifying a "complex" of principal and essential intermediate units for this sector to be set up in the Bari/Taranto/Brindisi pole.

(1) It is necessary to determine whether it is expedient to send propylene from Brindisi to the Polymer factories at Terni for processing into polypropylene or whether the staple should be produced direct by Monteshell-Polymer at Brindisi.

CHAPTER 4

Heavy and medium mechanical engineering
Selection of main and intermediary units to be set up in the pole

4.1. SELECTION OF THE MAIN PRODUCTIVE UNITS

4.1.1. *INTRODUCTORY REMARKS ON THE SELECTION OF THE MAIN AND INTERMEDIARY UNITS.*

Certain features in the selection of the main and intermediary units forming the integrated system of projects to be set up in the industrial pole must be stressed at the outset for a better understanding and assessment of what follows.

In the first place it must be stressed that the general purpose of the study is to select, plan and promote a system of essential intermediary units for the sector of heavy and medium engineering. Their presence in the area will enable the existing or projected main units in this sector (producing for the final market) to benefit from those external economies which are at present lacking—and whose lack, as we have seen, is primarily responsible for the disinterest shown by potential investors in the engineering industries in Southern Italy, despite the considerable inducements offered by the State. The existing resources (labour, infrastructure, etc) and the incentives themselves would thus be exploited under the new conditions of operation offered to these industries—conditions similar to those which have hitherto been confined to the great concentrations of Northern Italy and West Central Europe. Powerful forces would thus be created for the attraction of increasing private investment to the area of the pole, giving rise to a "spontaneous" process of development.

The almost simultaneous creation in this area of a number of large, modern main units in the field of heavy and medium engineering (properly selected, planned and promoted) will, of course, make its contribution to production, employment and investments; but the essential purpose of these main units is to pave the way for the system of intermediary units. The demands of the former must sustain the productive activity of the latter, thus breaking the present vicious circle described in 3.1.

Considering the notable economic scale on which many of the intermediary units must operate, at least in relation to the inputs of their main user industries any plan to create in the pole area a complete system containing all the types of intermediary unit represented in the great industrial centres would involve setting up main and intermediary industries to a total of over 200. Such a programme would obviously not be feasible.

It is in order to remain in the realm of the possible that the target has been limited to a system of essential intermediary industries. Further to reduce the difficulties in the way of simultaneous promotion, recruitment of skilled labour, and the obtaining of public funds (subsidies, etc.) the general policy adopted has been to select just sufficient main units to absorb the intermediary output. In other words, the overriding aim has been to select a minimum group of integrated units (main and intermediary).

In the present study, therefore, the selection of industrial projects differs profoundly from that aimed at in other industrial development studies and programmes for under-developed regions and countries. Instead of trying to determine the maximum opportunity for investment in industrial projects in relation to market conditions, financial sources and other factors, the aim here has been to keep numbers and size down to a minimum.

Likewise this study differs from previous industrial project selection studies based on the interrelation of industries, which differ not only in the way described above but also in that they are based on estimates of the final demand (and output) from which to determine intermediary demand (and output). Here, on the contrary, the starting point is a given level of intermediary supply (based on the economic size of the intermediary units considered essential) which is used to determine a certain number of main user industries—which are of course suitably selected from those having market prospects (1). In this regard it is to be noted that the attempt in this report to deal with the interrelation of industry in concrete terms, even if limited to the engineering industry, may be considered as an original contribution in the field of studies on the programming and selection of industrial projects. In previous studies based on input-output tables, the insufficient breakdown (partly because of the lack of available statistics, and partly because of the subordination of engineering to economic considerations) has meant that the forecasts for intermediate demand are often of little value in practice (2).

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(1) This can be done, as it could not in other countries, because the region and area in question belong to the European Common Market, one of the largest markets in the world. Most of the engineering trades have therefore great prospects of expansion. In view of the huge level of demand on this great market, investments by highly competitive concerns will not encounter any real medium-term marketing problems.

(2) Apart from certain of the bigger intermediate products (which nevertheless are not necessarily essential to guarantee a competitive system of production) the projects chosen by the aforesaid studies are in the class of industries making finished products. If the studies are concerned with sufficiently industrialized regions in countries with a developed economy they cannot, in practice, lead to any concrete results—except as regards basic industries of the vertical cycle type, or perhaps local industries. The proper industrial setting for the main processing industries would still be lacking. In such circumstances investments continue to flow into the industrial concentrations of the "richer" regions. If, on the other hand, the studies concern under-developed countries with little industry, some of the final manufacturing industries might be feasible, but only if there are high protective tariffs and, which is less likely, sufficient home demand—since the vertical structure and poor competitiveness of such industries would preclude any effective reliance on exports.

Lastly it should be noted that the various criteria used in the selection of main units have not been simply applied in the order in which they are set out in the report. The first stage consisted in the elimination of obvious industries by applying criteria 1, 2, 3, 6 and 7 (relating respectively to industries which required productive concentrations, which were local specialities of Central and Northern Italy or of other poles in Southern Italy, which impinged on enterprises or projects already under way in the area of the pole or which presented obvious market problems). The next stage (which aimed at narrowing the number of main units to the least number whose demand could absorb a given level of intermediary supply) became a process of gradual elimination, since it was impossible for technical reasons to use a general matrix and its 'inverse'.

As the process of eliminating the main units went on the more complex it became. The elimination of one unit could drop the total demand for a certain type of intermediate inputs below the necessary level. The reintroduction of another main unit with a large demand for the same type of intermediate input would cause new imbalance elsewhere. A further complication in the process was the interrelation between the intermediary units in question. In some of the intermediary units, in fact, a large proportion of their output is derived from these relationships. In selecting the main units it was therefore necessary to compute not only their direct demand but also their derived demand. In this second stage of selection criteria 4 and 5 (concerning skilled labour and limited inputs from essential intermediary units—meaning here a limited average input from the entire system of such intermediary units, not excluding the possibility of considerable inputs deriving from one or more of these units) were applied purely as guidelines, and not as decisive factors as might appear from a reading of the text.

In summary, it is to be stressed that the order followed in the text, namely, the selection of the main units followed by the selection of the essential intermediary units (accompanied by a balanced study of the entire system of integrated projects) does not correspond to the order followed in practice, as will have been appreciated from what has already been said. The first stage in the selection of the main units (criteria 1, 2, 3, 6 and 7) was followed by the selection, from the entire range of intermediary engineering trades, of those units considered essential. The second stage in the selection of the main units was then carried out, accompanied by a study of the balance of the entire system.

Although the 'final' selections of main and intermediary units are listed in sections 4.1.8. and 4.2.7. the final selection did not take place until after the preparation of the feasibility projects. Only from these could it be ascertained whether the chosen units could compete with similar units located in the Italian industrial triangle.

As the present final report was drawn up after the selections had been made it naturally presents the arguments in such a way as to lead directly to the final results. The preliminary report, on the contrary, was compiled in sections as research proceeded and was obviously subject to a process of revision. It contains provisional data obtained by certain methods, which were then revised and corrected as further research made it possible to apply more accurate methods. In the belief that the method of a first approximation followed by iterative analysis will be of interest to the expert, the text will contain appropriate references.

4.1.2. *LIST OF MAIN INDUSTRIES IN THE HEAVY AND MEDIUM ENGINEERING SECTOR*

A prerequisite to the work of selection was a properly complete list of all the main industries or lines of production in the sector (manufacturing finished products for the final market), excluding other branches of the engineering industry such as electrical and precision engineering, as well as the primary activities (production and primary processing of metals, etc.) and intermediary activities (auxiliary and subsidiary industries and trades supplying inputs of commercial and standard products to main industries).

For this purpose we used the Nomenclature of Industries in the European Communities (NICE), headings 340 to 391 inclusive. These headings were further broken down (using letters of the alphabet) so as to cover homogeneous industrial activities in as much detail as possible. It should be noted that these details were confined to finished products, as the sole purpose here was to select the main lines (intermediary units in the sector are studied in 4.2.).

The production lines making up the entire mechanical engineering sector, in accordance with the aforesaid list, are shown in the first column of Table 4.1.2 - I. The last three columns show lines which were excluded because they do not correspond with main industries in the sector of heavy and medium engineering.

It is pointed out that some of the lines which were excluded as coming under electrical engineering—such as the manufacture of electrical furnaces and ovens and electrical machinery for galvanoplastic welding (373/2a and 2b)—are on the fringe of the sector for the purposes of the present study. Although they benefit from the presence of intermediary units producing electrical equipment such as are in general essential to the electrical engineering sector as a whole, the presence of such units is not indispensable to them. Thus, though they belong to the electrical sector, they may be considered as capable of being 'inserted' into a system of heavy and medium engineering. However, in view of the fact that they normally have limited inputs from auxiliary units and would therefore be disqualified under criteria 5, their inclusion was in practice out of the question.

With regard to the manufacture of electric motors, though this involves a considerable amount of mechanical engineering, the presence of a certain number of typical intermediary units in the electrical engineering sector is essential for competitive purposes. There is no doubt, therefore, that the corresponding main lines (372/a and 372/c) should be attributed to the electrical engineering sector, to which they formally belong in any case. No particular comment is considered necessary on the other lines shown as belonging to this sector in the table.

The lines which are excluded as coming under precision engineering are all activities which require not only specially trained labour but also special auxiliary and subsidiary units. One border-line case is the manufacture of drawing instruments (391/40), which has only a minimum requirement for such special intermediary units. This line could, perhaps, have been included in the framework of a heavy and medium engineering complex, but here again the problem did not in practice arise because the possibility was ruled out under criteria 5.

Table 4.1.2. - I also excludes those miscellaneous lines which are not classified in the NICE list due to the variety of products they embrace. Although the original NICE list was in many cases subdivided to avoid just such difficulties, the above cases were left aside because of the obstacles in the way of a satisfactory breakdown. It should be noted, however, that most of the headings in question are of limited importance for the purposes of this study.

As stated earlier, the items corresponding to primary and intermediary activities in the amplified NICE list were left out. In certain cases the distinction between main and intermediary trades has had to be made on an *ad hoc* basis. Thus the manufacture of large internal combustion engines (369/1b) has been considered as a finished product industry while the mass production of internal combustion engines for operating machines (369/1a) has been taken as an intermediary industry.

The complete list of main units in the sector of heavy and medium engineering is shown in the first column of Table 4.1.2 - II, which represents the end-product of the various processes of selection.

4.1.3. *EXCLUSION OF MAIN INDUSTRIES WHICH NEED TO CONCENTRATE PRODUCTION OR WHICH ARE SPECIALITIES OF CENTRAL AND NORTHERN ITALY OR OF OTHER POLES IN SOUTHERN ITALY*

Exclusion of industries which need to concentrate production.

The first criterion [1] is aimed at excluding main industries which, for reasons of national economic policy, based on technical and economic considerations, need to concentrate their production.

In the order in which they figure in the NICE list, the main lines which are basically affected by the first criterion are the manufacture of farm tractors, ship-building (including repairs and maintenance), motor vehicle manufacture and aircraft construction (see Table 4.1.2 - II).

As regards farm tractors (361/20) it is obvious that the size of the Italian market is relatively limited by the small amount of land suitable for operating tractors economically, and by the large number of small farms, frequently split up into scattered holdings.

Despite fluctuations caused by agricultural crises, the number of new registrations in Italy rose from 22 400 in 1959 to 39 000 in 1963—an annual rate of increase of 15 %—due to current land reform and to the growing shortage of agricultural labour [2]. During the same period the total of tractors rose from 225 200 to 338 600 (247 000 Italian and 91 600 foreign), at a rate of 10 %. This trend would lead to the home market being somewhat saturated in the not too distant future (1970-72), when the total tractor fleet in the country would be around 500-600 thousand. The main home demand would then be for replacements. In view of the average age of the tractor fleet at that period the demand for replacements could not normally run at more than 50-60 thousand tractors a year.

Italian production of tractors for all purposes (agricultural, road-making, etc.) was around 53 000 in 1963 (37 000 wheeled and 15 300 tracked) and the production capacity was over 55 000 (the 1959 output was 31 000 with an annual rate of increase of 15 %). Exports in that year totalled 16 900 (a level already reached in 1960) and imports totalled 8 500 [3]. In practice the annual requirements of the home market towards 1970 should easily be met by the existing Italian industries and by the present level of imports—mainly coming from European countries.

It follows that any expansion of Italian tractor production from 1970 onwards would largely depend on increased exports, especially of wheeled tractors—since over 80 % of the limited European market for crawler tractors is already supplied from Italian exports, mostly FIAT. As the export markets would

[1] It should be stressed once more that the order in which the criteria are applied is not necessarily an order of priority.

[2] Unione Nazionale Costruttori Macchine Agricole—UNACOMA : "The Italian agricultural machinery industry and European production", 1963, and other publications.

[3] On the basis of production and foreign trade figures the home demand for tractors of all types in 1963 was 44 600; of these, as we have seen, about 39 000 were for agriculture and 5 600 for other purposes.

be in Europe and, more especially, overseas ([1]) the essential prerequisite is a highly competitive industry, capable above all of facing UK competition ([2]).

In Italy there are about a hundred tractor manufacturers, over half of whom are practically speaking craft firms with an annual output of a few dozen machines. Of the remainder only 18 employ over 250 workers, and all of them are in Central and Northern Italy (the single factory in the south has less than 250 workers); only 12 of these 18 are of national and, in some cases, international importance ([3]).

In reality these latter manufacturers (apart from those which are offshoots of automobile industries such as FIAT) do not possess a complete production system and confine themselves to assembling or to partial manufacture, fitting to their own machines assemblies bought from outside firms ([4]). To be competitive on the international market tractors must be produced by large-scale concerns capable of turning out about 20 000-30 000 tractors a year. Production must also be combined with an automobile industry and (as will be seen later) the Italian automobile industries must aim at increasing concentration to remain internationally competitive.

It follows from the foregoing that any expansion in Italian production would have to take place within the context of the biggest existing plants, and not through the creation of new ones. It is further to be noted that this industry would also have been excluded under criterion 7 because the medium-term market prospects are not clearly favourable.

With regard to ship-building, ship repair and maintenance (381/00) the exclusion is certainly justified by the fact that the existing shipyards in the pole area ([5]), with their long tradition of production in this sector, have had their activities restricted to ship repairs as part of the programme for modernizing the Italian ship-building industry (apart from the naval dockyard at Taranto, though this is also being run down). Within the framework of Community policy, the programme envisages a concentration of ship-building in other traditional areas (Naples and Palermo in Southern Italy) with a view to reaching an internationally competitive level.

The exclusion can therefore be based not only on criterion 1 but also on criterion 3 (local specialization of other poles in Southern Italy) and criterion 6 (since these activities already exist in the area, at least as regards repairs and maintenance). Since this activity also requires a large skilled labour force it could also be ruled out on principle under criterion 4.

In any case the industry would have been excluded for market reasons under criterion 7, in view of the long-standing world slump in the demand for new ships, and the growing trading difficulties which have to be faced by all the Common Market countries, especially through the strong competition from Japan and Sweden on the international market. While the world gross tonnage of ships delivered stayed around 9 million tons from 1958 to 1963, reaching 9.7 million tons only in 1964, the tonnage of ships delivered by Common Market countries in that year dropped from 3 to 2.2 million. Italy, after having recovered from a low point of 300 000 tons in 1962, slipped back from 600 000 tons to something less than 500 000 tons in 1964, while productive capacity remained at around 700 000 tons.

Motor vehicle manufacture (383/a) constitutes a typical industry for which a policy of concentration,

([1]) The prospects for expanding Common Market sales of Italian tractors are not too bright. Registrations of farm tractors in the major Common Market countries are tending to level off on the whole. Sales in the Federal Republic of Germany dropped from 100 600 in 1962 to 95 700 in 1963—a drop of 4.8 % (the fact that home sales dropped by 5.9 % and exports by only 2.4 % indicates that the home market is getting saturated). The sluggish market is causing a notable weeding-out of producers, with numerous mergers, take-overs, etc. In France there have been signs of saturation since 1960; between 1959 and 1963 annual sales declined from 81 650 to 77 630 and output from 80 200 to 68 500. The average national index of plant utilization works out at around 50 %. The biggest drop was in 1962, with an output of 60 400 tractors. According to certain research, saturation point would be reached when tractors total 1 250 000; the total at the start of 1964 was 950 000. A point to be noted is that imports of agricultural tractors rose from 12 480 to 29 530 between 1959 and 1963 (including over 10 700 from the U.K.) to the concern of the producers. In Belgium, with a fleet of 60 000 farm tractors at the end of 1963 and 6 500 new registrations during the year, it was considered that agricultural requirements were almost balanced. In the other European countries and the rest of the world the trends of demand likewise hold out no great hopes for Italian exports. With regard to other markets in which Italy is already present, Yugoslavia does not produce enough for its requirements but only imports minimum quantities, if at all, and indeed is trying to develop its exports; Spain produces for its own needs, importing very little; in Brazil and Argentina the local industries are on the way to covering home requirements.

([2]) The United Kingdom is the world's biggest producer of wheeled farm tractors. In 1962 its exports to the main trade areas as follows : Commonwealth 33 710; EFTA 34 570; EEC 28 650. Exports to other countries were 56 210—making a total of 153 140 tractors. Production of agricultural tractors in the USA is mainly for home consumption (output was over 182 300 in 1962 and 186 200 in 1963). Exports are small and are directed to developing countries in the Americas and elsewhere as part of economic aid; exports to Europe are virtually nil because of technical specifications and prices.

([3]) FIAT, Same, Landini, OM, Lamborghini, Carraro, Meroni, Allis Chalmers Italiana, Lombardini, Orsi, Venieri, and Trebo.

([4]) Same, the second largest tractor firm in Italy, is a case in point, fitting Perkins engines and other assemblies and commissioning special components for its own tractors from other firms.

([5]) The Stabilimenti Navali at Taranto (formerly OCNRT), controlled by the IRI-Fincantieri group, delivered the last ships built there in 1960-1961. After having carried out a programme of modernization they have done nothing but ship repairs and fabricated steelwork jobs since 1963. The remaining labour force of just over a thousand is underemployed by the amount of work taken on by the yard (see section 2.1.2).

or at least non-dispersal, is necessary both in Italy and at the Common Market level. In the face of growing competition from European and American sources inside the Common Market—which in some ways is to be considered a good thing—it is undeniable that the European industries must increase their production levels so as to become more competitive both inside the Community and on the international market. This applies not only to the size of firms but also to the plants in a given area.

In this connection it should be remembered that the highest daily outputs in Europe in 1964 were those of the Volkswagen works, with 4 800, followed by FIAT with 3 400 (1). Although the experts hold that the minimum daily output required to remain competitive on the international market is 2 500, a further increase in the production levels of the big European manufacturers would undoubtedly be a fundamental factor in improving their competitiveness (a no less important factor would be the concentration of factories supplying standard components, if certain parts, accessories, etc., could be standardized).

To consider setting up a new plant in the pole area would be flying in the face of these trends. Even if we did so, and worked on the theory of a plant producing 60 % of the annual requirements of Southern Italy (excluding Sardinia, there is an annual increase of 12 % in new registrations in the regions under consideration), and exporting 20 % of its output, the scale of such a plant on the basis of this optimistically calculated demand would be 265 000 vehicles per year in 1970, equal to 950 a day (2).

The presence of intermediary units is vital for the industry in question, because the final product depends to the extent of 60 % on outside components or operations, of which there is a great number.

With a plant on the scale assumed above—and allowing for the production of various models, even if only in a very limited number—the level of demand for products from subsidiary concerns, and particularly for standard and commercial products from local suppliers, would not be high enough to permit an economic size for these intermediary concerns, the more so as several intermediary units of the same type would be needed. The result would be an increase in production costs.

The thesis that all future increases in the total demand (home and foreign) on the Italian automobile industry could be met from a hypothetical plant in Southern Italy is too unreal to be considered; however, if such a plant existed its output by 1970 could only be on the small scale given above.

At first sight it might appear more reasonable to set up a plant for assembling vehicles in the pole area to supply the needs of the south (excluding the islands). To be realistic one could assume that such a decision would be taken by the factory which sells most cars on the Italian market. The annual volume of assembled vehicles would be about the same as that calculated above for a manufacturing plant.

Judging strictly from the technical and economic standpoint it is unlikely that such an enterprise would be suitable for the pole area. The actual assembly would be uneconomical, since the cost per car would be at least 6 % more than its production cost in Northern Italy. While the cost of transporting the components from the north to the pole would be about half that for a complete car, the cost of packaging the parts (which is negligible for a complete car) would be pretty high. The combined packaging and transport costs from the factory to the assembly plant would be about 40 % higher than for the transport of the finished car from the factory in the north to the sales agent in the south. This is without taking into account the cost of conveying the assembled car from the pole to its final market destination.

It should also be noted that fewer cars would be assembled than would be the case in the parent factory, and the assembly cost could therefore be slightly higher. Further increases could result from the inevitable repair work for damage during transit, mistakes in the number and type of components sent, etc.

The more logical alternative of creating in the pole an assembly plant partly supplied from local sources is economically out of the question because, for the reasons given above, locally produced components and accessories would prove more expensive at the output level indicated.

The foregoing arguments against the economic convenience of an assembly plant in the growth area are obviously of a general nature and would not apply in the case of a limited assembly of particular types of vehicle (industrial vehicles, etc.) such as already takes place in the Caserta-Naples-Salerno pole area.

With regard to aircraft construction and repairs (366/00) the production of large commercial aircraft is at present confined to a few countries, including the USA, the UK and France. The industry needs not only the proper conditions but also vast resources for design work and scientific research which it would be unreasonable to expect in the near future in Italy, and more specifically in the pole area.

Italy's annual production of light aircraft varies around 100-150 units, including helicopters, coming mainly from 8 large to medium plants, one of which is in Palermo (3).

Numerous Italian concerns cooperate in the production of military aircraft on a national or international basis. It should be stressed that aircraft construction

(1) British Motor Corporation 3 100; Opel 2 600; Renault 1 200.

(2) Motor-cars and light truck versions.

(3) Aeronautica Sicula at Palermo, producing helicopters.

and repair is largely based on this type of work, which is the basis of an expanded production. Of the firms concerned (which include FIAT), there are 3 of medium to large size in Southern Italy, namely: two in the Caserta-Naples-Salerno pole area (1) and one in the area under study, at Brindisi (2).

The expansion of light aircraft construction in Italy seems to depend on factors of overall demand and should be achieved through the expansion of existing factories, which have a certain tradition, rather than through the creation of new ones. Hence its exclusion under criterion 1.

In view of the existing enterprises mentioned (in Sicily and in Campania) the industry would also be excluded under criterion 3 in that other pole areas in Southern Italy have already specialized in the field. The need for a high percentage of semi-skilled and skilled labour would then disqualify it under criterion 4, and lastly, with regard to parts manufacture and the repair and overhaul of aircraft, the industry would be excluded under criterion 6 because there is already a big firm in the pole area itself.

Exclusion of industries which are specialities of Central and Northern Italy.

Under criterion 2 certain industries are excluded because they may be considered local specialities of Central and Northern Italy, quite apart from any considerations of production scale covered by criterion 1. The ones concerned are main industries which benefit from particular conditions in certain northern and central regions so that, in the absence of special reasons, the creation of similar enterprises in the pole area would be inadvisable, at least in the medium-term planning.

Taking into account the overall competitive conditions which would be achieved by the new integrated production organization in the sector of heavy and medium engineering in the pole area, the industries to be excluded under criterion 2 are confined to the manufacture of small arms and the manufacture of wrapping and packaging machinery (see Table 4.1.2 - II).

The manufacture of non-military small arms (355/90) in Italy has been traditionally concentrated in the Brescia area. This industry relies heavily on the work of independent skilled craftsmen who supply high-quality components at a low cost. The production of the large firms in the area is organized on the same basis.

In view of these prevailing conditions it is considered unfeasible to create from scratch in Southern Italy an industry which could compete.

Apart from the cost problems, the industry as organized in Italy would be excluded as requiring a high proportion of semi-skilled and skilled labour (criterion 4).

The manufacture of wrapping and packaging machinery (365/20) by modern methods is a fairly recent development in Italy and is concentrated in two areas, namely: Modena-Bologna-Parma and Milan. The only two important plants in Southern Italy are in the Caserta-Naples-Salerno pole area (3).

Even in the two northern areas, with their built-in labour advantages, the firms have to face serious foreign competition. It is therefore considered that medium-term expansion of this industry should be confined to these areas, particularly by way of expanding the existing plants. It should be stressed that the industry requires a high proportion of trained labour and would therefore be excluded under criterion 4.

Exclusion of industries which are specialities of other pole areas in Southern Italy.

This third criterion is based on considerations of regional policy for the location of industry in Southern Italy. It is pertinent to add that the process was not simply that of identifying the specialized industries operating in the sector in the various southern poles and listed in 3.2. In certain cases, as here, it was considered useful to carry the analysis down to the level of individual trades.

Under criterion 3 the main lines to be excluded from the new system to be set up in the Bari-Taranto-Brindisi pole area are as follows: the manufacture of metal furniture, office machines, railway rolling stock, motor-cycles, motor-scooters, lightweight vans, bicycles and mopeds. From certain aspects these, like other industries already mentioned, can be considered specialities of other growth points or pole areas (see Table 4.1.2 - II).

With regard to the manufacture of metal furniture (355/6a) it was borne in mind that in Southern Italy this industry is concentrated along the Latina-Pomezia axis, which runs off from the Caserta-Naples-Salerno pole. Of the 14 large or medium concerns operating in the south no less than 8 are located in this area (4). The biggest concentration in Central and

(1) Imam, Aerfer (at Pomigliano d'Arco, Capodichino (Naples) and Alfa Romeo's aircraft division (also at Pomigliano).

(2) SACA, at present employing about 650 workers, which repairs jet and piston engines and also makes parts for commercial and military aircraft (see section 2.1.2.).

(3) The largest one is Famind, in Naples, which employs about 500 people and makes automatic machinery for making cans, cartons, etc. At Nocera Inferiore (Salerno) the Buscetto factory employs less than 250 people and produces batchers and canning machinery, etc.

(4) Salpa (Naples), Metalmeccanica (Salerno, under construction), Metalplex (Benevento), Mobili Mim (Pomezia), Matema Mat (Pomezia), Iannicola (Latina), Somma (Latina) and Tulli (Latina), all with a labour force ranging from 100 to 250.

Southern Italy, however, is in the province of Latium, on the fringe of the area covered by the Cassa per il Mezzogiorno (1). In the pole area there are only two medium-sized concerns (2), which have to face strong competition from the larger northern industries, and from the firms in the Pomezia-Latina area and in the rest of Latium.

Even if it were not accepted that this trade is specialized in other pole areas in Southern Italy its elimination for the purposes of the present study would also be indicated on the grounds of its limited contribution to direct demand from essential intermediary units in the sector (criterion 5), in view of its extremely low ratio of input to equipment.

As regards the manufacture of office machines (362/00) this industry is concentrated in a very small number of firms in Italy. Most of the twenty or so firms are located in Piedmont and Lombardy, but there are two important firms in the Naples area with a total of over 27 000 employees. Italian production of office machinery in 1963 was 463 000 portable typewriters, 236 000 standard typewriters, 689 000 calculating machines and 36 000 adding machines.

Any new plant should be designed for a minimum labour force of at least 1 000; the optimum size would be from 1 200 to over 2 000 employees depending on the type of product (3).

However, the creation of any big new factory in Italy for the production of typewriters, calculating machines or adding machines seems out of the question for a good number of years. The prospect is rather for the expansion of existing plants.

Italian productive capacity in this industry at the present time is, indeed, greatly in excess of home market requirements, and the gap has been rapidly increasing since 1950. Production capacity has been expanding at the annual rate of 13 % for typewriters and 23 % for calculating machines over the last 13 years, which is much higher than the rate of increase in world demand for these goods (5 % and about 8 % respectively) and the increase in Italian demand (12 % and 11 %). This high rate of expansion has thus been sustained by very large increases in exports.

Medium-term forecasts of increases in home and foreign demand envisage an annual rate of 4 - 7 % for typewriters and 5 - 8 % for calculating machines. On the other hand, the share of foreign markets achieved by these Italian products is so high that further large gains are hardly likely, especially in view of the fiercer competition on the international market (4).

The Italian plants now operating are increasing their productivity at such a rate (the growing competition being a particularly strong stimulus towards technical progress) that they could meet the bulk of any further increase in world demand without any increase in manpower.

Any need to increase further the production capacities at present available in Italy will accordingly be too limited in the next few years to justify the creation of a large new factory. Moreover, as already stated, Italian production capacity is likely to be increased by extending existing plants, all the more so as some of them have not yet reached the optimum size in terms of scale economy.

Even if the right conditions for the creation of a large new factory were to arise in the more distant future, the choice would hardly fall on the Bari-Taranto-Brindisi area but rather on areas in which the industry is already established (Ivrea, Crema or Naples). The reason for this is that technological developments are creating conditions in which different plants are increasingly dependent on each other (trend for the specialization of certain plants in the production of common parts, interchangeability of labour, availability of essential auxiliary and subsidiary trades).

It may be concluded that the manufacture of office machinery can be excluded as already being a speciality of another pole area in Southern Italy (Caserta-Naples-Salerno).

The manufacture of railway rolling stock (382/00) is largely governed by the investment programmes of the Italian State Railways. About 80 % of the industry's activity (which includes repair and rebuilding of rolling stock) is for the State Railways, and the other 20 % is for the foreign market. Total production has been declining at the rate of 4 % per year since 1959, though there has been some increase in foreign business. About 80 % of production is rolling stock other than locomotives.

In Southern Italy the industry is based on a quota system for the various factories which is imposed on the railway authorities by law. Certain growth points

(1) Appio Officine Meccanicche, Biffani David, Pisano Bros, Gregorini, Buffetti, Cassinelli and IFI, all in the province of Rome, with a labour force ranging from 100 to about 250.

(2) Lamel (Taranto) with less than 100 employed on this trade, Mobilmet (Putignano, Bari) and Crom (Bari) with a total of about 120 workers.

(3) The strong competition on the national and international markets in this field makes it necessary to adopt production techniques and internal economies which are beyond the scope of small and medium-sized concerns.

(4) Market shares for Italian office machinery :

	Typewriters	Calculating machines
Italy	85 %	87 %
Europe (excluding Italy)	10 %	26 %
USA	4 %	28 %
Canada	4 %	39 %
America (excluding USA and Canada)	25 %	44 %
Africa	38 %	49 %
Asia	16 %	23 %
Oceania	8 %	33 %

The relatively low share of the market for typewriters in the American continent and Europe is largely due to the existence of Italian subsidiaries producing in those areas.

and pole areas specialize to some extent in the industry, and in some cases it is the predominant industrial activity.

There are 16 works in the South, of which no less than 7 are concentrated in the Caserta-Naples-Salerno pole (1). On the fringe of the area covered by the Cassa per il Mezzogiorno, in the province of Rome, there are 3 large works. There are another 3 large works in the Palermo area in Sicily.

In the Reggio Calabria development area at Torre Lupo the recently completed Omeca works, employing 1 045 workers, is apparently destined to become the largest plant in Southern Italy, employing several thousand people and absorbing most of the medium-term increase in demand.

In the Grande Regione (Major Region) itself the industry is represented in Lecce by the Nuove Officine Meccaniche e Ferroviarie (200 workers), while on the fringe of the pole area, at Matera, there is the Ferrosud project (IRI-INSUD group) with a probable labour force of over 700. This latter works will turn out locomotives, while the Omeca output will consist of other rolling stock, particularly goods wagons.

From what has been said it follows that the manufacture of railway rolling stock would be excluded under criteria 3, 6 and 7.

As regards the manufacture of motor-scooters and motorcycles (385/a) a distinction should be drawn between the two.

In order to be competitive on the home and foreign markets, a motor-scooter industry needs to be concentrated in the same way as the automobile industries. It should be noted that Italy possesses two of the world's largest firms in this field (Piaggio of Genoa and Innocenti of Milan), so the production of motorscooters would be ruled out under criterion 1.

The production of motor-cycles is also concentrated in Northern Italy, with 31 firms (of which 8 have a labour force of over 250). However an offshoot of one of the big northern concerns recently established in Palermo apparently intends to extend its production to motorcycles and three-wheeled trucks.

In view of this latter enterprise and of the medium-term market prospects for these products (see below), it was considered inadvisable to include this line in our pole area in the light of criterion 3.

(1) Officine Meccaniche Casertane (Caserta) with 630 employees; Officine Fiore (Caserta) with 401 employees; Ocram (Naples) with 925 employees; Aerfer (Naples) with 1 595 employees; Sice (Naples) with 170 employees; Avis (Castellamare di Stabia (Naples) with 80 employees; Cantieri Metallurgici Italiani (Castellamare di Stabia) with 130 employees. Some of these concerns have a varied production, and the number given refers to the total payroll. The IRI works at Frosinone, in the Latina-Pomezia-Frosinone area, will shortly be coming into operation.

Again from the market viewpoint it should be pointed out that the medium-term sales prospects for any large new unit producing motor-cycles and motor-scooters are very poor (with some exceptions in the field of three-wheeled vans and trucks). In effect production of motor-cycles, light motorcycles, motor-scooters and three-wheeled trucks in Italy dropped from 455 000 units in 1959 to 384 000 in 1963—at an annual rate of 4 % (2). It must be remembered in this connection that Italy is responsible for almost 94 % of the total Common Market production of light motor vehicles (engine capacity over 50 cc).

Over the same period home demand dropped at the rate of around 9 % and foreign demand at almost 4 %. The line in question would therefore be excluded under criterion 7.

Lastly, as regards the manufacture of bicycles and mopeds (385/b), production of bicycles in Italy rose from 600 000 in 1959 to 825 000 in 1963 (an annual rate of 8 %). Production of mopeds (up to 50 cc capacity) rose from 150 000 to about 290 000 over the same period (an annual rate of almost 18 %).

The only concerns producing bicycles on an industrial scale in Southern Italy are in the Caserta-Naples-Salerno pole area and along the Pomezia-Latina axis; these are Bianchi Sider (Salerno) and Chiorda Sud (Cisterna, Latina), each of which employs around 200 workers.

These two modern factories could, with appropriate expansion if necessary, cope with the demand for bicycles and mopeds in Southern Italy over the next few years, with something to spare for export. It follows that this line should be excluded from the group of main units to be planned and promoted in the pole, since it is already a speciality of other pole areas in Southern Italy (criterion 3).

4.1.4. *EXCLUSION OF MAIN INDUSTRIES REQUIRING A HIGH PROPORTION OF SKILLED LABOUR*

The following analysis is based on the Italian system of trade union grades or "categories", which are applied to wage-earning labour as follows (3):

— "Unskilled" labour, comprising Grade 4 workers (general labourers) and Grade 3 workers (ordinary machine minders, also referred to as "specialist labourers");

— "Semi-skilled" labour, comprising Grade 2 workers, viz: machine-operatives for non-automatic

(2) These figures exclude not only mopeds but also three-wheeled vans and trucks. Production of the latter two types was 34 000 units in 1959 and over 52 000 in 1963, with an annual rate of increase of 11 %.

(3) The term labour does not inclued chargehands and shop foremen, who are considered as being in Grades 2 and 1 of the salaried staff.

processes, or who in any case require a certain technical ability and/or responsability; members of gangs responsible for changing machine attachments for the various components produced; materials handling workers and certain classes of plant maintenance workers; inspectors; most of those employed on services;

— "Skilled" labour, comprising Grade 1 workers, viz: machine operatives for non-automatic and special processes; certain classes of inspectors and workers employed on services; most maintenance workers who repair working equipment (machinery, special plant and equipment, and plant in general).

After this necessary introduction it should be stated at once that one of the fundamental stumbling blocks to the industrialization of Southern Italy at present is the shortage of skilled and semi-skilled labour, which offsets the advantage of the fairly good supply of general labour. This applies to some extent, of course, to the well known situation in the main European industrial centres, where ordinary labour is generally in short supply, and trained labour, though relatively more available than in Southern Italy, is certainly not plentiful.

In the case of a new medium-sized factory to be set up in the Northern Italian industrial triangle it would not be very difficult to find the requisite skilled and semi-skilled labour, even if it had to be drawn from other existing plants. Thus a limited demand on the labour market might give the impression that the supply is highly elastic.

When, on the contrary, the case is that of an important new large-scale factory—or better still, when one examines the overall situation produced by the sum total of new concerns establishing themselves in the Northern industrial triangle during periods of expansion—the result proves to be otherwise. Research carried out specially for this study shows that in the heavy and medium engineering sector only 25 % of Grade 1 labour requirements and 40 % of Grade 2 requirements are on average met from workers who can be put straight on the job in these capacities, after preliminary testing. The remaining requirements of Grade 1 labour (75 %) and Grade 2 labour (60 %) have to be supplied by putting workers through training courses (which vary from 3 to 9 months, and in some case 12 months, depending on the job) and by training in the factory when production starts up (1).

The situation is very different in the budding industrial areas of Southern Italy (and in the pole area) in view of their limited labour market. This is true whether one is considering the installation of a new unit or, which is more to our point, the launching of a programme to set up simultaneously a whole system of projects which might require at least 8 000 to 10 000 workers, of whom about half would be skilled or semi-skilled.

In the pole area the large and medium industrial concerns started over the past few years have drained off the trained or easily trainable labour from the traditionally small local engineering firms, many of whom now find themselves in great difficulties. While admitting that this source of trained workers may still play a role in the future, at least for certain trades, there is no doubt that it can be practically ruled out in the medium term, i.e. for the period during which the industries we are studying will be set up.

As training in and out of school develops in the future, and in general as the industrialization of the pole proceeds, so should the availability of trained labour increase. The organization of proper vocational training will not, however, be able to keep pace with the requirements of the new industries planned for the area. As has been said, the problem will be a medium-term one, which will be aggravated by the still limited annual output of the new intercompany training centres ('Centri Interaziendali'—see section 1.3.2).

In the conditions as described it is expected that the group of units which establish themselves in the pole will, on the whole, be able to find already trained in the area 5 % of their Grade 1 workers and 10 % of their Grade 2 workers (including those emigrants who will come back home from Northern Italy and abroad). These percentages are only a quarter of the corresponding figures for labour availability in Northern Italy. Furthermore, the lower levels of training and experience in the South make it likely that the firms concerned will have to run refresher courses for these workers.

Almost all the training requirements—to the tune of 95 % for Grade 1 labour and 90 % for Grade 2—will have to be met by means of training courses for unskilled workers engaged locally (apart from a certain essential proportion of workers brought from the parent firm and elsewhere in the North).

In particular it is considered that at least 10 % of the Grade 1 and Grade 2 labour for the large units (main units and certain auxiliary units such as foundries) will have to be "imported". The remainder would have to consist of locally-engaged unskilled workers who would be sent on training courses lasting 3 to 12 months at factories in the North or abroad while the new factory is being built and equipped. These workers would then complete their training on the job during the first two years of production.

The medium and small units in the system—i.e. those not capable of organizing initial and further training courses in the North—would have to rely much more

(1) The large and medium firms already in the area, on the contrary, obtain or replace only a limited part of their skilled labour force direct from the labour market. Most of their wants are filled through their own permanent schools, where young men are given a 2-year course to qualify as Grade 2 semi-skilled workers, followed by a year's practical experience to prove their abilities, then a practical test to qualify as Grade 1 skilled workers (see 3. and 7.).

heavily (perhaps to the extent of 50 %) on imported skilled and semi-skilled labour. The deficit would be made up by local workers to be trained on the job during the initial period of production (see 7.).

For firms intending to establish themselves in Southern Italy the initial cost of organizing a skilled labour force is considerably increased by such factors as the larger number of workers who have to attend training courses, with the consequent cost of travel to Northern Italy and subsistence allowances, a cost which is obviously not incurred by new firms establishing themselves in the Northern industrial triangle. Additional extra cost for Southern Italy is represented by installation allowances and travelling expenses (at least for a certain period) for the workers imported from the North.

Preliminary research, backed up by feasibility projects, indicates that the total initial organizational costs for large new engineering concerns setting up in Southern Italy would average about twice as much as the corresponding costs in Northern Italy (from 60 % to 150 % more depending on the proportion of skilled labour). This is a considerable outlay, representing on average about 8 % of the total investment in fixed and operating capital, and reaching about 12 % in certain engineering industries.

This initial extra cost of finding skilled labour for new factories in Southern Italy may not greatly affect production costs as spread out over the average life of the factory (generally not to the extent of more than 1 %), but it is a decisive factor in production during the first years of operation. Normal production rate is reached more rapidly in comparable factories which set up in the Northern industrial triangle. It is estimated that new factories in the pole area will take at least 6 months longer before they are running normally, precisely on account of the larger proportion of untrained people who will have to be taken on. Nor should it be overlooked that this is the minimum time-lag expected. It could even be 1 or 2 years if special facilities are not organized for the new industrial system, and these will involve considerable effort, even if promoted by big concerns.

The above disadvantages for engineering concerns establishing themselves in Southern Italy are not the only factors taken into account in applying the present criterion. Due weight has also been given to the attractive conditions of the unskilled labour market—the attraction for prospective firms being, in practical terms, that unskilled labour there costs less than in the North or in the other large industrial centres of Europe.

Although at present the actual cost of labour at Bari is in general 15-20 % lower than in the Italian industrial triangle there are good grounds for supposing that when the new industrial system is set up the difference, as regards unskilled labour, will have dropped to 5 % if present trends continue. In substance, this margin in favour of industries entering the pole would only correspond to the present differentials between the larger and smaller industrial centres inside the Northern industrial triangle due to differences in the cost of living.

It might be objected that in Southern Italy or in the pole area this advantage is offset or outweighed by the greater absenteeism and higher turn-over of labour. As regards average absenteeism it is believed that this will fall to the levels which obtain in the industrial triangle (with permissible seasonal peaks), taking into account the organization of the incoming industries and the influence of the works foremen, shop foremen, and chargehands imported from the North. As for turn-over, this will certainly continue at a slightly higher level than in the Northern triangle but its effects will only be felt during the initial production period. Under normal production conditions in large factories of the type in question a moderate intake of new personnel does not slow down the rate of production. The effect on labour costs would therefore be insignificant (1).

On the assumption that the cost of skilled and semi-skilled labour will have caught up with the Northern rates by the time the new industries enter the pole (one might have accepted a continued difference of about 5 % for these grades too, but it was preferred to take into account the effects of increased demand on a limited labour market) one can say in general that the smaller the proportion of such labour employed in the new industries, the bigger will be the benefit gained from the relative cheapness of unskilled labour as compared to the cost for similar firms in the North. Since the ratio of the various grades varies from one engineering industry to another the gain in labour costs in the pole area will range from 1 % to 4 %. Allowing for the varying incidence of labour costs on overall production costs (from 12 % to 25 % depending on the industry) it follows that the average effect on overall production costs would not exceed 1 % (if the present difference of 15-20 % still applied in the case of unskilled labour the effect on overall production costs would be about 3-4 %).

The benefit is undoubtedly a slight one. However it must be noted that competitive margins in modern industry are in general based on the combined effect of numerous slight cost differentials, and that this gain would tend to cancel out the higher cost of filling requirements of skilled and semi-skilled labour. Last, and most important, quite apart from any additional direct or indirect charges on investment and operation, it is incontestable that the problem of finding sufficient skilled and semi-skilled labour in the

(1) It is not expected that firms will incur increased expense for the training of personnel taken on when operating conditions have become normal as this training would take place in the same way as it does in most Northern industries. Likewise no extra expenditure is foreseen for additional facilities for commuting workers, since the pole will not only be a collection of industrial projects but will also have properly developed public services and facilities.

South puts a great strain on internal factory organization and is one of the main reasons why entrepreneurs are reluctant to invest in the South. The present criterion must therefore be applied.

It is precisely because of these obstacles in the way of training a skilled labour force from scratch that, while acknowledging the need for precision engineering as an essential component of the pole, it was agreed in section 3.2 that the promotion of this industry could be put off to a second stage, concentrating in the first stage on certain basic pre-requisites.

These same difficulties are also the root cause why, in its general approach and the formulation of some of its general criteria, this study aims at reducing requirements of skilled and semi-skilled labour.

In this study the problem of creating industries in under-developed areas has been based on new concepts of integration (the promotion of a whole system of main units together with the more essential intermediary units) instead of on the traditional concepts of vertical structure (promotion of isolated main units which are compelled in practice to carry out internally all, or almost all, of the processes which go to making the final product). This approach not only increases competitivity but also reduces requirements of skilled and semi-skilled labour for a given output of the finished product.

Requirements of skilled and semi-skilled labour for a main unit backed up by essential intermediary units are anything from 5 % to almost 20 % lower than those of a similar unit organized vertically, depending on the processes and equipment used. At this point it might be objected that in the first case the auxiliary units (tool-making, maintenance and service units, etc.) and subsidiary units such as gear-cutting plants require mainly skilled and semi-skilled labour. In other words, the requirements are the same, and are merely distributed differently between the various units.

But the contention that, all things being equal, a 'horizontal' system, i.e. a system of integrated industries, requires a smaller skilled labour force is based on quite other grounds. In effect, if we examine an integrated system of main, auxiliary and subsidiary units in the sector of heavy and medium engineering the total of skilled workers is, on average, 10 % below the figure for a system of corresponding main units with a vertical structure (1). Even in the larger factories of the vertical type the nature and scale of the production processes do not permit full utilization of skilled manpower.

The advantages of an integrated system are not only numerical but also qualitative, since the saving is greatest in respect of skilled craftsmen. In view of the specialized nature of their work their utilization in a vertically organized industry is even more sporadic than that of semi-skilled men. An added benefit in the integrated system is thus a reduction in the relative proportion of skilled labour.

One of the general principles of this study is that of planning the selected main units on the scale of the biggest concerns in Northern Italy if not in the EEC, within the limits allowed by the market and other considerations. As already noted, the purpose of this is not only to increase competitiveness but also to reduce specifically the proportion of skilled and semi-skilled labour. Generally speaking, in fact, any increase in the production scale of a factory brings a corresponding reduction in the percentage of skilled and semi-skilled labour, since certain components can be mass-produced using special machinery.

The tooling of a particular process becomes an economic proposition when the consequent saving in labour costs, taken in conjunction with the total volume of production over a given period, enables the necessary equipment to be paid off at a reasonable rate (the same considerations apply to the replacement of existing equipment by special plant and machinery to improve productivity). In the manufacture of power cultivators, for example, in small to medium-scale concerns, the proportion of skilled productive workers of Grades 1 and 2 (excluding indirect labour) is over 45 % of the total for direct labour, whereas in the larger concerns this figure is less than 30 %. A similar comparison in the case of the manufacture of burners shows results of the same order, and this applies also to engineering trades which are not typically mass-producing. In the machine tool industry the proportion of skilled and semi-skilled labour in small to medium-scale firms is 80 % in general. In the largest Italian plants the figure is 70 %. In certain countries, such as the Federal Republic of Germany, where there are plants of this type employing several thousand workers, the figure is as low as 50 - 60 %.

Aside from the obvious competitive advantages, it is fair to say that, in the case of the pole, this general principle of setting up large-scale concerns aims at obtaining a further reduction of over 10 % in the trained labour requirements of the whole group of main units as compared with the requirements of a group of medium-sized units having the same productive capacity.

Lastly, with regard to the general principle of confining the number of large-scale main units in the system to the minimum needed to justify the existence of the most essential intermediary engineering units in the pole, it is again noted that this criterion was adopted not only to reduce the difficulties of simultaneous promotion but also with the primary aim of cutting down the overall requirements for skilled and semi-skilled labour.

In conclusion, in view of the importance of this problem it was decided to include a further specific cri-

(1) This is an indicative figure, which varies according to the main products of the group as a whole.

terion in addition to those mentioned—namely, that the selected main industries should not require a high proportion of skilled labour.

The application of this fourth criterion could drastically reduce the number of skilled workers for the same total of employees, since skilled labour requirements vary considerably from one heavy or medium engineering industry to another.

Table 4.1.4 - III gives the percentages of skilled and semi-skilled labour related to total labour in the major concerns in the great industrial concentrations of Northern Italy, as based on a direct survey (1). This fairly comparative survey was carried out by production lines, and was also based on the selection criteria already mentioned so as to exclude particular lines. The table groups the percentages into classes (20-30 %, 30-40 %, 40-50 % and over 50 %). The class in which each line of production falls is marked by the symbol 'I'.

It should be explained that the totals on which the percentages are based include both direct and indirect labour. Direct labour is largely replaced by machine-minders in the case of mass-production and, in the case of non-automatic processes, by machine-operatives or workers who must have a certain degree of technical skill and/or responsibility. It is only in this second case that trained craftsmen are required. Indirect labour (apart from workshop and service labourers) comprises gang operatives (responsible for changing machine attachments, etc.), plant and machinery maintenance workers (2), inspectors of components and finished products, operators of works trucks and cranes, storemen and service workers who are all Grade 1 or Grade 2 workers. The proportion of these grades in the indirect labour force normally ranges from 55 % to 80 % (3); depending on the products of the main unit the indirect component can be from 15 % to 35 % of total labour (on average 20 %).

Table 4.1.4 - I gives the combined percentage of Grades 1 and 2 for each production line. The percentages are only valid within the limits of the definitions and production characteristics considered.

(1) Generally speaking official statistics are not sufficiently broken down in this field; definitions and results are not sufficiently detailed for this study.

(2) Allowing for variations between lines and excluding special cases one can say that in Northern Italian industries an average of 1/3 of urgent maintenance on plant is done internally (the remaining 2/3 routine and non-routine maintenance is done by auxiliary units); as regards maintenance of machinery, 2/3 is done internally by the main units and 1/3 by the auxiliary units.

(1) In general those employed on internal overhaul and maintenance of plant and machinery, inspection and workshop services (boiler-house, power house, compressor rooms etc.) belong to Grades 1 and 2, while operators of works trucks and cranes are in Grade 2. Storemen consist only partly of Grade 2 workers.

As a general rule the criterion adopted has been to exclude any production line which—on the scale of the bigger Italian plants—would require over 50 % of skilled labour. These comprise manufacture of the following products: safes (355/6b); metal-shaping machine tools (363/12); tools for use in machines (363/20); textile machinery and accessories (364/11 and 364/12); sewing machines (364/20); machinery for mills and "pasta" factories (365/1a); machinery for the edible oils industry (365/1b); machinery for the sugar industry (365/1c); machinery for the wine-making industry (365/1e); machinery for making other beverages (365/1f); machinery for the chemical and allied industries (365/1g); machinery for processing rubber and plastics (365/30); mining and drilling plant (366/10); machinery and plant for the iron and steel industry, etc. (366/20) and for the mechanical preparation of building materials (366/30); lifts and hoists (366/5f); machinery for wood working (368/10) and for manufacturing and processing paper and board (368/2a and 368/2b); machinery for book production (368/2c); laundry and dry-cleaning machines (368/30); machines for the leather and shoe-making industries (368/40); large and medium internal combustion engines (369/1b); hydraulic and heat turbines (369/20); special pumps (369/3b); compressors (excluding those for domestic electric appliances) (369/3c); equipment for non-electric soldering and welding (369/70).

Certain industries which would be excluded under this criterion do not figure in Table 4.1.4 - I as they had already been eliminated for other reasons, namely: the manufacture of small arms and their ammunition (355/90); the manufacture of wrapping and packaging machinery (365/20); ship building, ship repairs and maintenance (381/00) aircraft manufacture and maintenance (368/00) (see Table 4.1.2 - II). Some of the lines mentioned (such as 365/1b, 365/1e, 366/30 and 369/1b) would also have been eliminated under criterion 6 (similar units existing or being set up in the pole) while item 364/20 would also fail the test under criterion 7 (market reasons). In this latter industry (sewing machines) Italian production has been dropping at the rate of 7 % annually since 1959, while abnormal competition from Japan has been spreading throughout the Common Market—as any Italian, French or German producer will testify.

The only exceptions to the application of criterion 4 are the making of metal-removing machine tools (363/11), cranes (366/5c) and continuous mechanical conveyors (366/5d). The establishment of a large machine tool plant in the pole will mean that one of the 'aristocrats' of the engineering sector is represented, which will provide a training ground for the labour needed eventually to man the whole precision-instruments sector. The manufacture of cranes and mechanical conveyors is an advanced form of fabricated steelwork, and will be a development of

one of the traditional activities in the pole area. The work requires certain craftsmen (tracers and scribers, welders, coppersmiths, sheet metal workers, etc.) who are essential to an expanding industrial centre.

Apart from the above exceptions it should also be noted that, in the final projects, the proportion of skilled labour in the units selected for inclusion in the individual projects does not always tally with the data given in the aforementioned table. This is mainly due to market considerations which emerged in the course of analysis and which indicated that part of the output should consist of special products which were not 'mass-produced'.

4.1.5. *EXCLUSION OF MAIN INDUSTRIES HAVING LOW INPUTS FROM ESSENTIAL INTERMEDIARY UNITS IN THE SECTOR*

Criterion 5 aims at simplifying the complex job of selecting the units making up the whole system and cutting down work at the project stage. No less important, it is another facet of the underlying aim of facilitating promotion of the units which will make up the pole.

Assuming, for the sake of argument, that the main lines so far selected had similar input coefficients, the total demand required for all types of input from intermediary units to keep the latter operating economically would be provided by a relatively small number of main units if these normally produce on a large scale. If, on the contrary, the main units only produce on a medium scale their number would be correspondingly increased.

In other words, it is not enough simply to plan the selected units as big as possible; account must also be taken of the fact that absolute output, and hence inputs, vary from one industry to another for technical or economic reasons. In the manufacture of lifts and hoists, for example, mass-production is out of the question because of the lack of standardization in civil engineering specifications, etc. For this and other market reasons the production levels and inputs of the biggest Italian plants call for much smaller intermediary units (auxiliary and subsidiary units) than are needed by the biggest plants in the fabricated steelwork sector, for example. The lift and hoist industry needs medium-scale intermediary units, the fabricated steelwork industry needs large-scale intermediary units. This is one of the reasons why, in selecting the main units for the system, preference has been given to those which permit the establishment of large-scale units.

In this connection it should once more be stressed that the preference for large units in the absolute sense is solely for the purpose of reducing to a reasonable number the main units which must be promoted simultaneously, and is not due to any idea of favouring big units as against smaller units. It is worth repeating here that, on the contrary, this study envisages the establishment of medium and small units which will form a considerable proportion of the essential intermediary units to be set up, and that the presence of these essential intermediary units will above all favour the small and medium main units which are already in existence or will be built in the future, since it is precisely these latter units which suffer most from the drawbacks of the present vertical structure.

Very broadly speaking, therefore, and without prejudice to special overall considerations affecting the choice of the system, it was decided to eliminate from the survivors of the previous tests those industries which are not normally large-scale producers in Central and Northern Italy.

The fact that the arguments apply to Italy and not to the Common Market as a whole (as will be seen in section 4.1.8. and in the commercial discussion of each project) is due to the general principle that the size of the selected main units is to be kept below that of the biggest European units to avoid the possibility of overproduction—though they will be able to compete in the Common Market and on the international market. In any case it would be unrealistic to duplicate these biggest plants in the new pole, as some of them are unparalleled in Europe.

On the other hand it would seem, on the basis of available data and within the limits of the industries referred to above, that the results for Italy can be extended to the Common Market—though with various exceptions such as mine headworks, cutlery, the manufacture of lifts and hoists, non-electric industrial furnaces, taps cocks and valves, etc., and meters for gas, water and other liquids. There are plants of these types in other Common Market countries whose levels of production are appreciably higher than those of the corresponding Italian plants. Furthermore, for some of the industries in question (such as the manufacture of automatic vending and distributing machines) there are plants in the USA producing on a much bigger scale than the largest plants in the Common Market.

Lastly, in applying this criterion, allowance has been made for the fact that the production of certain commodities is normally combined for technical or economic reasons, and the parameters used in evaluating the scale of production have varied accordingly.

The lines eliminated are the following: mine headframes (353/30); standard-gauge railway track fixtures and fittings (353/40); hand tools (355/11); agricultural implements (355/12); cutlery (355/20); hardware and locksmith's wares (355/30); heavy metal containers (355/41) and light metal containers (355/42); lifts and hoists (366/5f); refrigerators for non-domestic purposes (369/50); non-electric industrial furnaces (369/6a); bakery ovens (369/6b); plumbing fixtures (369/8b); automatic vending and distributing machines (369/9a); fire-fighting equipment (369/9c); meters for gas, water and other liquids (391/10) (see Table 4.1.2. - II).

During this stage of selection it was found that, bearing in mind the size requirements of the whole system as described above, certain principal lines qualifying on grounds of size should nevertheless be eliminated because of their low inputs from certain essential intermediary units. While in the case of main units of a limited size, the variations in input from the various essential industries are immaterial in practice (with the odd exception), in the case of units of an appreciable size these variations need to be evaluated since the choice of one main unit rather than another could cause a considerable difference in the input demand.

In particular, in view of the difficulties encountered in achieving, with a limited number of selected main units, a big enough demand to justify economically the creation of various types of tool-making plants (which are in many ways the key elements in mechanical engineering and a training ground for the more highly skilled workers), the tendency, other things being equal, has been to eliminate main units which have low inputs from tool-makers. In deciding to leave out a particular industry the reasons why it makes little demand on tool-making plants should be quite immaterial—typical examples being industries which usually do not call upon such auxiliary units because they normally make their own tools inside the factory, as in the case of the manufacture of metal-shaping machine tools, or else because they need large quantities of special machinery, as in the manufacture of tools for use in machines, etc.

Since in general there is some relationship between the economic utilization of machinery and the production scale of a main unit, it was found that the above analysis tended to be a repeat of the preceding selection on the basis of size, though the limits were raised for certain industries.

Under this criterion the following lines would be eliminated on Italian standards: cast-iron radiators (355/5d); metal furniture (355/6a); cast-iron bath tubs (355/7d); metal-shaping machine tools (363/12); tools for use in machinery (363/20); machinery for milling (365/1a), the edible oils industry (365/1b), the sugar industry (365/1c); the wine-making industry (365/1e), other beverage industries (365/1f) and the chemical industry (365/1g); machinery for wrapping and packaging (365/20); machinery for processing rubber and plastics (365/30), for civil engineering (366/30, 366/4b), machinery and plant for the iron and steel industry, etc. (366/20), for the woodworking industry (368/10), for the manufacture and processing of paper and board (368/2a, 368/2b), for book production (368/2c) and for turbine manufacture (369/20). In Table 4.1.2 - II these industries are marked with the symbol "r" to distinguish them from those in the preceding group indicated by "X".

At this point it is important to stress that the industries in which medium sized plants predominate and which accordingly require limited average inputs from the essential intermediary units (X), and the industries which in any case have low demands for machinery (r), may nevertheless require relatively high inputs from a certain type of subsidiary unit. During the process of elimination some of these industries were in fact included in the initial stage for the very purpose of swelling the demand from the particular intermediary unit in question.

The manufacture of weighing machines, etc. (369/9b) proved to be a case on its own. As things are at present the manufacture of automatic and semi-automatic counter scales and industrial weigh-bridges would by itself have absorbed almost half of the output of one of the pole's essential intermediary units, namely a projected foundry for non-ferrous metals. As market research has indicated that in the future the fused aluminium parts of these products would tend to be replaced by pressed sheet steel it was thought prudent to eliminate this group of products and replan the scale of the foundry accordingly. Apart from this forecast trend, the reason for the decision was to avoid an overproduction of non-ferrous metal in the event of some of the main units being subsequently excluded (the main units finally selected in fact are to some extent interchangeable with others in the sector without producing any imbalance in the system of intermediary units).

4.1.6. *EXCLUSION OF MAIN UNITS BECAUSE OF EXISTING PLANTS OR PROJECTS UNDER WAY IN THE POLE AREA*

Under criterion No. 6 the intention is to exclude from the list of possible main units to be planned and promoted those for which there are already large modern enterprises in the pole area or for which important projects are already under way (see Table 4.1.2 - II) (1).

Even where the medium-term forecast for demand would permit the creation of a new plant, the policy has been that expansion of production should take place through the enlargement of existing plants. On the other hand, lines which are already represented in the area, but on a small or medium-scale and not on a properly industrialized basis, are not eliminated from the list.

Discussion of the previous criteria has shown that ship-building, ship-repair and maintenance (381/00), the construction of railway rolling stock (382/00) and aircraft manufacture and repair (386/00) are activities which are represented (or soon will be represented) in the pole area, and in such a way that they should be eliminated under the present criterion.

(1) Analysis of existing concerns and projects already under way will be resumed in section 4.2. when an estimate is made of their demand on the essential intermediary units in the pole.

An important project now being carried through by the Breda and Isotta Fraschini group is the BRIF SpA Company. This will produce high-speed diesel engines of medium size (369/1b), as well as smaller agricultural machinery and gearing, for a total investment of about 5 thousand million lire and providing employment for 400 workers.

Criterion No. 6 rules out the manufacture of machinery for the edible oils industry (365/1b), for the wine-making industry (365/1e), and machinery for the mechanical preparation of building materials (366/30), since it is possible that one of the existing units will prove capable of modernizing and extending in the near future, on certain conditions (see section 2.1).

To the toll of main units which have already fallen under the axe we can now add, by virtue of the present criterion, light metal structures (353/20), the construction of large boilers (354/10), the manufacture of large tanks for liquids and gases (354/20) and of industrial taps, cocks and valves (369/8a), and the assembly of industrial vehicles involving construction of special equipment (383/b).

In the field of light metal structures, in fact, there are certain concerns in the area of the pole which have been built up by extension and modernization of pre-existing plants. At Bari there are medium units of this kind (1) and at Taranto two medium-sized plants are well on the way to completion (2). Furthermore there is one plant in the project stage at Bari, and another two at Taranto.

As regards the manufacture of large boilers and industrial tanks, the Breda group is now building at Gioia del Colle (Bari), at an investment of 4 000 million lire, a plant to be called Termosud SpA which will turn out not only boilers and storage tanks but also boiler bodies and diaphragms, heat exchangers and distillation columns.

As regards the manufacture of industrial cocks and valves there is the recently completed Pignone Sud SpA (Breda-ENI group) at Bari. Though the main product at present consists of valves for petroleum products and petrochemicals there is a section equipped for industrial cocks and valves, and it is reasonable to expect that the plant's production could be extended to include the entire range of these products. Lastly, under the head of specially equipped units for the assembly of industrial vehicles there already exists in the pole a large plant employing over 1 000 workers and supplying the bulk of the demand for these products in Southern Italy (3).

(1) The first is "IVAP", which has recently come into the industrial area and works primarily on doors and window frames, apart from sheet steel work, guard-rails for highways, curtain-walls, plasticised steel doors, etc., and which is scheduled to employ 300 men by the end of 1965. The second is "Uniblock" SpA, which is also a newcomer into the industrial area and works in the field of galvanized iron and cold-rolled sections making mainly door and window frames, locks, etc., and should eventually have a labour force of 200. At Taranto and Brindisi there are no newly established firms, though there exist small and medium-sized local concerns in this field (see section 2.1.2.).

(2) "Lamel SpA" and "Metalstruttura Srl" which employ about 400 men between them.

4.1.7. *EXCLUSION OF MAIN INDUSTRIES FOR MARKET REASONS*

Criterion No. 7 was used to weed out those industries which, for obvious market reasons, would not come up to the mark as important industries to be established in the pole in the medium run.

We say in the medium run because the time needed for drafting this present report, promoting the whole complex, preparing detailed plans for the individual units and building and equipping them means that initial production would not start before 1969, and the big new units will therefore not be running normally until 1971-72.

Short-term fluctuations in supply and demand can therefore be ignored and, with particular reference to the Italian market, the same applies to the recession of 1964, which persisted into 1965 (the year in which this report was completed) but was showing signs of giving way to a period of economic recovery at the end of the year. If these slump conditions had been taken into consideration almost all the industries finally selected would have been excluded under this criterion.

It is common knowledge that from the medium and long-term viewpoint the products of heavy and medium engineering come, generally speaking, within the wide range of products which have the best prospects for expansion in Italy, the Common Market and on the international market—whether as capital goods or as consumer durables.

It is nevertheless a fact that certain products or groups of products are exceptions to this general development, or for various reasons are liable to run into market difficulties. Hence the following lines are excluded:

a) Industries which are going through a period of structural crisis and are subject to scaling-down, modernization and re-planning. Such is the case with ship-building (381/00).

(1) Officine Calabresi SpA, which recently moved into the Bari industrial area. It assembles and converts the following types of industrial vehicle : dumper trucks, refrigerating trucks, containers, vans, works trucks, skip trucks, tank trucks, fire trucks, street watering trucks, extending ladder trucks, hydraulic and mechanical loader trucks, various types of trailers, etc.
Officine Romanazzi (Bari), should also be noted : this concern assembles and repairs bodies and trailers, including special types, and employs about 200 workers (see 2.1.).

b) Industries whose market, for various reasons, is stationary if not actually diminishing, and which suffer from too much competition, viz: motor-scooters and motor-cycles (385/a), sewing machines (364/20) and tower cranes (366/5a) (1).

c) Industries whose market is too concentrated nationally, and hence liable to violent fluctuations depending on the investment programmes of the major customer or customers. Since a big new plant could not produce solely for export, such fluctuations could seriously jeopardize its prospects, bearing in mind that the major existing plants often possess a high degree of unused capacity for this reason. Under this head comes the manufacture of railway rolling stock (382/00) for the State railways.

d) Industries whose market (even if expanding) is governed mainly by a restricted number of customers, the producing firms often being subsidiaries of these customers, or connected with them in some way. This applies to the manufacture of meters for gas, water, etc. (391/10) for the big public utility concessionaire companies.

e) Industries which, in order to be competitive on the home and foreign markets, would have to be linked with other industries that tend to concentrate themselves in the existing industrial centres. This applies to tractor factories (361/20), which must be linked with the great automobile industries.

f) Industries which in some way compete with the products of the main units finally selected, viz: metal hollow-ware other than in steel (355/7b); cast-iron radiators for central-heating systems (355/5d) and cast-iron bath-tubs (355/7d).

Lastly, as stated in section 4.1.5, the manufacture of weighing machinery (369/6b) is a case apart inasmuch as the forecast changes in the market and manufacturing techniques would distort factory inputs to the detriment of the subsidiaries which are essential units in the design of the pole.

Summing up, the following lines are eliminated for market reasons, to swell the list of those already rejected under the previous criteria: cast-iron radiators for central heating systems (355/5d); cast-iron bath-tubs (355/7d); agricultural tractors (361/20); sewing machines (364/20); ship-building and ship-repair (381/00); railway rolling stock (382/00); motor-scooters, motor-cycles and light vans (385/a); meters for gas, water and other liquids (391/10); tower cranes (366/5a) and weighing machines (369/9b).

As a result of the entire process of elimination the main industries in the field of heavy and medium mechanical engineering which are eligible for inclusion as new concerns in the pole area are reduced to the following:

353/10 Heavy metal structures:
- — Sheds and prefabricated building components
- — Miscellaneous heavy items (excluding bridges and overpasses);

355/5a Sheet-metal cookers;
355/5b Oil burners;
355/5c Sheet metal radiators for central heating systems;
355/7a Enamelled sheet-steel hollow-ware;
355/7c Sheet-metal bath-tubs;
361/1a Self-propelled combine harvesters;
361/1b Pick-up balers;
361/1c Motor cultivators, motor mowers and other similar power machines;
363/11 Metal-removing machine tools;
366/4a Earth-moving equipment:
- — Excavators
- — Mechanical shovels, dumpers etc.;

366/5b Mobile cranes;
366/5c Cranes (excluding tower and mobile cranes);
366/5d Continuous mechanical conveyors;
366/5e Lift trucks;
369/3a Centrifugal pumps.

4.1.8. *LIST OF MAIN UNITS FINALLY SELECTED - MARKET ASPECTS AND SIZES OF THESE UNITS*

The main lines selected have been grouped into 8 manufacturing units. (See Table 4.1.8-I).

In certain cases the grouping is based on affinities of production or distribution, as in the case of Unit IV, comprising self-propelled combine harvesters, pick-up balers, motor cultivators, motor mowers, etc (products 361/1a, 361/1b and 361/1c). The association of products 364/4a (earth-moving machinery) and 366/5b (mobile cranes) in Unit VI, and of products 366/5c (overhead travelling cranes and others) and 366/5d (mechanical conveyors) in Unit VII is also due to production similarities. In Unit II the grounds for combining products 355/5a (sheet metal cookers), 355/7c (sheet metal bath-tubs), 355/5c (sheet metal radiators) and 355/7a (enamelled sheet-steel hollow-ware) are even stronger in that the separate markets for these products are too small individually for the economic operation of high productivity plants such as those for enamelling, etc. A special case is the combination of oil burners (355/5b) with centrifugal pumps (369/3a) in order to counterbalance the seasonal variations in demand which would affect the production processes and assembly of the former.

The above combinations, it must be noted, are those which have enabled other big concerns in Italy and elsewhere in the Common Market to achieve advanced production methods and competitive dimensions which in some cases would have been out of the question for each product taken singly, due to market limitations.

(1) See section 4.2.8 — Market aspects of Unit VII — The manufacture of cranes and continuous mechanical conveyors.

In view of the type of survey undertaken and the overall aims and methods of promotion outlined above, the analyses given here are not in the nature of fully developed marketing studies. They do not contain all the elements proper to market studies of macro-economic type. Thus, certain commercial aspects are covered, without going into details of the demand for the various models of the products in question in relation to prices, functional characteristics, etc.; likewise, indications are given of the share of the market on which the new units can count, without discussing the best commercial policy to achieve this share.

These analyses are therefore concerned solely with the essential market data needed to ensure that the whole system of selected main units and their preliminary projects is based on economically feasible types and levels of production in the light of the prospects for the next ten years.

It should also be borne in mind that, considering the time and means at our disposal, it would have been out of the question to prepare macro-economic market research studies for all the products covered by the selected main lines. Such complex studies are a big job even for those large organizations and firms which carry them out just for their own products or groups of products. In our case the effort would have had to be extended simultaneously over a wide range of products in the sector of heavy and medium engineering.

An effort of this kind would in any case have proved redundant, at least in part, since the big firms are fairly well acquainted with their own field of activity and keep a close watch on developments by means of frequent surveys and studies. The information provided would have been scanty—and moreover it would be ingenuous to think that an outline of market prospects, and hence investment prospects, would suffice to persuade some of these big firms to set up the new enterprises proposed for inclusion in the pole. The intelligent approach to promotion, on the contrary, is to concentrate directly on those large expanding enterprises which are optimistic about future prospects and are therefore interested *a priori* in new investments. This approach means convincing such firms that, thanks to the incentives and the modern system of intermediary units which will be available in the area, etc., it may be more profitable to set up a new enterprise in the pole area than in the industrial area where they operate at present. The feasibility projects, with their detailed comparisons of investments and production costs at Bari and Milan, constitute the groundwork of this promotional approach.

It has already been said, and will bear repeating, that plans for promotion and implementation are flexible, and that in the event it will be the entrepreneurs concerned who will decide the final composition and structure of the pole's output.

It should again be stressed that the output levels and classes of products which are indicated here for the chosen main units are solely for the purpose of preparing the feasibility projects and obtaining reliable estimates of overall inputs and outputs. They are not intended to indicate, much less dictate, a pre-determined range of products to entrepreneurs who might be interested in backing any of the engineering industries selected for the pole. Within certain limits of plant size and market prospects for the various types and styles of commodity, the choice will be made in accordance with the particular policies and approach of the entrepreneur (traditions, risk evaluation, sales organization, market share, possession of patents, licences, etc.). Accordingly, as will be seen in section 4.2.5, the estimated input requirements of the chosen main units have been simplified on the basis of a typical range of products whose inputs are representative of a modern industry, reasonable allowance being made for market considerations.

From the outset the possibility has also been recognized that not all of the chosen main units making up the system described herein need necessarily be set up. In practice, for various reasons, their place may be taken by other main units in other heavy or medium engineering trades which make equivalent demands on the essential intermediary units but which were initially discarded—whether under one of the various criteria (other than marketing) or simply to cut down the size of the system. (1)

The above statements do not detract from the usefulness, indeed the necessity, of the market analyses and projections made in this section, nor from the validity of the whole system proposed in this present report and the relevant feasibility projects.

The argument that, with a relatively small number of projects for main units, it is possible to generate a system of essential intermediary units capable of creating in a new industrial area in Southern Italy—and for an entire sector—external economies which bear comparison with those of the great industrial concentrations, can only be sustained if the input-output ratios on which the integrated system is founded refer to levels of production and types of product which in general reflect the probable development of the market (determined by the action of economic and technological factors on supply and demand) at the time these units go into normal production.

By the same token the practical value of these main-unit feasibility projects to entrepreneurs interested in new investments depends, from the promotional viewpoint, on the fact that they deal with productive structures which reflect technological and market trends. Only if prepared along these lines and in sufficient detail can the aforesaid projects be convincing and enable the entrepreneur to fit the information

(1) At the end of the promotion stage there will be a necessary review of the inputs and outputs of the system as finally decided, in order to check that demand and supply are in balance as regards the essential intermediary units, etc.

readily to his own particular requirements in the way of specific products, processes, etc.

To prepare the way for subsequent parts of our report, this section sets out to make the following analyses for each product or group of products, as applied to the Italian, EEC and international markets:

a) Recent trends, current position and forecasts of overall demand;

b) Outlook for basic types of the products concerned;

c) Overall supply and size of the major concerns in the field;

d) Various market data, such as selling price and distribution cost of the product;

e) Market share on which the producing unit can count, and proposed size of the unit.

Under heading *a)* the results would have to confirm that the products concerned will be included in the general expansion forecast for the sector. It should be noted however that variations in the rate at which demand may increase for the products of certain selected lines as compared to others are not of decisive importance; a relatively small increase in demand over the whole European Common Market causes a substantial absolute increase even in the case of the output of a big new enterprise, due to the size of that market.

As regards heading *b)* account is taken of the fact that numerous activities in this sector are subject not only to the constant evolution of production techniques but also to changes in the characteristics of types produced which are reflected in the production apparatus used and hence in the demand upon intermediary units. In effect, this demand depends not only on output levels but also on the type of products turned out by the main units. In the case of motor cultivators, for example, inputs may come mainly from cast-iron or non-ferrous metal foundries, depending on whether the chassis is of iron or aluminium castings. Another example is the gradual ousting of mechanical (drag-line) excavators by hydraulic types. The input requirements of a plant producing the still prevalent mechanical (drag-line) excavators would be very different from the demands made upon essential intermediary units by the plant set up in the pole, whose output would probably tend to concentrate on hydraulic excavators. In the case of mechanical (drag-line) excavators the accent would be on iron and steel casting and gearings from subsidiary foundries and gear-cutting plants. For hydraulic excavators this type of input would largely be replaced by input from subsidiary hot forging and stamping units. In both cases the reference is to the essential intermediary units envisaged (1).

(1) Naturally with regard to the remaining groups of intermediary units supplying standardized and commercial products, the inputs required for hydraulic excavators would concern hydraulic controls, etc.

Under heading *c)* the analysis deals with competition and the minimum size at which the requisite unit (which may also make other products) can compete on the European market. This critical size is governed by the varying effects of different sizes on manufacturing costs (processes, production apparatus, labour) distribution costs and supply costs, as well as on financing, research and design possibilities, etc.

With regard to the information given under heading *d)* it is to be stressed that this reflects the sales policy and distribution network that was found to predominate in the largest Italian concerns in the field. The selling prices practised by the firms, and the costs of distributing their products, are essential elements to be used subsequently in the projects, with suitable adjustments, for the purpose of estimating operating costs and profits. Although the transport share of distribution costs is given on a purely indicative basis it appears that, even when borne by the manufacturer, it has in most cases very little effect on overall operating costs (2-3 %). Even more important, the corresponding differentials in the South as compared to the North are reduced to negligible proportions in this respect (due to the differences in territorial distribution of sales in relation to demand there may be variations of up to 15 %, but these produce overall cost increases of less than 0.5 %).

Heading *e)* constitutes the end-product of the research, i.e. determination of the output level and range of products for the main units selected. The market outlets for these units have been evaluated conservatively by considering only the future increases in demand and ignoring the fact that in many selected fields a good part of supply in the Common Market countries (and particularly in Italy) at present comes from enterprises which are growing less and less competitive because they are too small or for other reasons. No allowance has been made for the fact that the highly competitive units proposed will, like other big concerns, be in a position to absorb not only the lion's share of future increases in demand but also some of the market at present taken by existing marginal producers. It is a commonplace that even in the case of products for which demand is greatly on the increase supply seems to develop at an almost constant pace with the demand; the soundly-based highly-competitive large concerns gain more of the market while the smaller concerns struggle.

To accept undiscriminatingly this hand-in-hand progress of home supply and demand would have meant excluding all the remaining lines and consequently giving up all hopes of creating any project. On the contrary it should be acknowledged that the fact of evaluating the market share of the big new units solely on the basis of future increases in demand on the aforesaid markets (particularly the Italian market) has lent even greater weight to the results. If, as would be more accurate, the market shares for the selected units are referred to the levels of demand in the period 1970-75 (when production will have begun

and will have already reached normal levels) it can be seen that they represent very modest shares, even on the least favourable assumptions.

Lastly, it remains only to stress that the size permitted by the market prospects to all the selected units equals or exceeds the 'critical size' indicated on the European level; in terms of output they will all rank among the largest Italian concerns in their field.

As regards the reliability of the data used in analysing overall supply and demand in Italy and the Common Market it should be noted that to some extent these have had to be estimated. In the case of Italy this is due to the lack of sufficient breakdown in the official data on industrial production. This lack is less marked in other Common Market countries, notably France and the Federal Republic of Germany. At the request of Italconsult, statistics have been supplied from public and private sources, including some unpublished data. Unfortunately since each country uses its own different classifications, definitions and units of measurement it proved impossible to use the official data as they stood. To obtain figures for the whole of the Common Market it was necessary to make adjustments, and the possibility of errors inevitably arises (1).

The results of surveys conducted among producers and distributors by Italconsult were substantially limited by the understandable reticence of the people questioned, notwithstanding the employment of a large group of qualified engineers and economists.

Nevertheless it is considered that the facts set forth here, even if only tentative, are valid enough for the present purposes.

For each chosen unit an evaluation is given of the market share on which it should be able to count, and the appropriate level of output.

The discussion of market considerations for each selected main unit takes the form of an analysis for each product or group of products, preceded by a brief description of marketing aspects in the individual Common Market countries, with a special section on the Italian market.

The Common Market analysis begins with a brief review of the growth and trends in overall demand (home demand and exports) and in overall supply (production and imports). Figures for trade between Common Market countries are appropriately separated from the corresponding figures for international trade. The period considered is from 1959 to 1963. The choice of the first year was virtually imposed by the difficulty of obtaining data in certain countries, and in any case our interest was in recent market trends. The last year was, at the time this report was prepared, the most recent for which figures were available for all the member countries (this report was completed in the second half of 1965).

This analysis is followed by projections of home and overall demand in 1970 and in 1975, obtained by extrapolating the trends and adjusting in the light of long- and medium-term forecasts of demand for wider groups of products, sometimes in conjunction with similar forecasts of developments in important user industries, as given in studies from various sources (2).

In certain cases the results of the projections are given as a 'bracket', i.e. a high figure and a low one. In any case the probable increases in demand in the Common Market countries for the periods 1965-70 and 1970-75 have been conservatively estimated in accordance with the aims of this report; the figures and increases which we give will almost certainly be considerably exceeded in practice.

Lastly, the discussion of the Common Market deals with the size of the largest existing plants in member countries and, in the light of technical and economic research conducted with a view to preparation of the projects, a minimum economic size is laid down for the unit in question. The section on Italy follows the same lines as that on the Common Market but is more detailed.

Thus the figures for home demand for the various products are broken down, where necessary, by user sectors. In Italy the period 1959-63 has the advantage of excluding the effects of the economic slowdown in 1958 and the recession of 1964 and much of 1965. Nevertheless, in order to make due allowance for the effects of the economic crisis and of possible structural changes we also give estimates of production and demand, etc., for 1965 (since this report was drafted before the end of 1965 the figures are broad estimates).

Projected demands for 1970 and 1975 in Italy have been calculated directly and systematically for each user sector. For capital goods these projections have been based on net investments needed for the increased output of user sectors (ratios between net investment and output) and replacement needs as calculated from existing equipment. In the absence of data on existing equipment, home demand has been projected from the gross investments needed for the increased output of user sectors (ratios between gross investment and output). The activity of user sectors has, in its turn, been projected on the basis of official plans and programmes, suitably toned down where necessary, and their extrapolation for the period 1970-75.

(1) For example, the production and foreign trade figures for certain products are based in some countries on the number of pieces or units, in others on total weight, in others on value, etc. Again, some countries list commodities separately, while others list them in more or less related groups, etc. Obviously the process of adjustment by multiplying the number of pieces by average weight, breaking down grouped commodities into percentages, and so on, produces only approximate figures, but these are nevertheless more significant than the original heterogeneous data.

(2) We have avoided the simple extrapolation of the 1959-63 trends since the period can only partly be considered "normal" and is also too short.

It should be noted that 1966 is considered the year when the Italian economy returns to normal after recovering from the recession; this should mark the start of a new period of economic development, even if at a much lower rate than during the ten years of the 'miracle' and starting from much lower levels than the peaks of 1963. Obviously, if the constructional sector is slow to pick up this will invalidate the projections of demand for products connected with this sector and the forecast increases in demand would have to be deferred accordingly.

As regards consumer durables to be produced by the main units, Italian home demand has been projected on the basis of the following factors: population increases by social group and geographical area; forecast increase in incomes, and corresponding elasticity; past experience of tendency to buy new products as habits change, etc.; replacement needs in relation to the total of such goods already in use and their distribution. The data for projecting these demand factors have been obtained from existing studies, backed up by Italconsult surveys in the case of certain products.

The structure of home supply in Italy is dealt with not only as regards the distribution of plants according to size and major regional concentrations but also in relation to competitiveness, utilized capacity and major enterprises as known in 1965. In addition, figures are given for average selling prices obtained by manufacturers of the most commonly sold types of goods, or goods for which the prospects are brightest; details are also given of distribution systems and costs (packaging, transport costs for home and export markets, etc.). With regard to the size of the market on which each unit can count we give the distribution of possible sales levels in periods of 'normal' activity on the home market (subdivided between Southern Italy and North-Central Italy where appropriate) and on foreign markets.

It should be noted that the annual sales figures given in this section refer to the 'actual' types and models envisaged for each unit, and that the output is not converted into representative 'standard products' until later (see section 4.2.5). As has been said, these levels have been calculated on the basis of market projections and on the assumed competitiveness of the new units. This latter quality is taken for granted here, inasmuch as the output levels in all cases equal or exceed the minimum economic scale (critical size) for Europe, and it is consequently assumed that production and distribution will be organized in the most efficient manner (a discussion on Organization and Methods will be found in each feasibility project). Another basic assumption is that the main units will be set up by large concerns in the appropriate field, with wide experience and an international reputation, preferably as joint projects associating major Italian and foreign producers.

The comparison between the sales levels envisaged for the units and levels of home demand (with increases) takes account of the fact that the chosen units should start producing in 1969 and should achieve normal production by 1971. (The dates given depend on the time it takes to promote the projects which constitute the entire pole, and this in turn will affect the scheduled programmes of construction and erection, etc; if the date for coming into production and reaching normal production levels were to be put back one year—i.e. to 1970 and 1972 respectively—this would leave the arguments and figures virtually unaffected).

Bearing in mind the European role planned for these units, there is some case for considering that the apportionment between home and export markets fails to make full allowance for the possibilities of exporting (which could be achieved by cutting down home sales). On the other hand, one must remember that if too long a time elapses between the completion of this report and the start of the promotion programme there is a risk that the share of the home market available to the new units might be reduced. In fact, though the broad outlines and conclusions of the report were communicated over a year ago, during the course of publication news was received that important new projects were already under way for new investments in activities which are the specific concern of the main units selected here, and in view of the practically unchanged operating conditions in Southern Italy these investments will, it is feared, be directed to the traditional areas in the North.

Unit I

HEAVY METAL STRUCTURES

The market for heavy metal structures in the EEC

For the purposes of this project, heavy metal structures comprise sheds, prefabricated building components, bridges and overpasses and miscellaneous heavy structural steel-work (excluding boilers and boilerhouse plant and pressure vessels). (1)

(1) Fixed and movable metal road and railway bridges; metal foot-bridges and overpasses, metal sheds and components, steel structures and frames, prefabricated components for aircraft hangars, metal cantilever roofs and penthouses; movable and fixed metal domes; metal gasholders; metal silos; elevator carparks; cycle stands and sheds, covered stands for stadiums, etc; metal trusses and girders; metal frames and framework in general for building; lattice beams and structures; metal roofing; metal safety screens; metal sluices and gates for locks, docks and canals; electric-welded structures for machinery; tunnel reinforcements, metal structures for blast furnaces and mines, etc. Standardized constructional units are generally included under heavy metal structures, provided the production is sizeable; this covers gasproof doors, blast doors, explosion doors, fire doors and furnace screening, water wheels, etc. Also included are metal structures for industrial plant, machine beds and the like if made in a structural steelworks for plant and machinery manufacturers. As stated, we have excluded boilers, boilerhouse plant and pressure vessels such as can be made by a suitably equipped structural steelworks, since these have been considered as separate trades during the previous process of selection.

Recent trends in heavy structural steelwork in the Common Market as a whole (see Table 4.1.8 - II) have shown an average annual rate of expansion of over 9 %. In the period 1959-63 internal demand in the Common Market increased faster than production (11 % rate as against 9 %) which led to a sharp jump in imports (almost a sixfold increase in this short time) and a decline in exports (at an average annual rate of 5 %).

In 1963 the production of heavy metal structures (as defined above) stood at 3.2 million tons, while imports were 82 000 tons. Exports to the rest of the world had dropped to 230 000 tons. Trade between member countries, on the contrary had already reached 150 000 tons. The Federal Republic of Germany and, to a slight extent, France appeared as net exporters inside the Common Market while the other countries were net importers.

To be specific, over 60 %, of EEC imports came from EFTA countries (mainly from Austria and the United Kingdom) and about 36 % from the USA. Just over 20 % of total EEC exports went to EFTA countries (almost half of these to Switzerland), 23 % went to Mediterranean countries (mainly to Turkey, Algeria, Egypt, Greece, Israel and Spain) and 15 % to various African countries. Exports to the American continent came to over 20 % of the total, of which about one third went to the USA and the rest to Latin America. The bulk of the remainder went to Australia and Asia.

Production in the various member countries in 1963 was as follows, in descending order, with rate of increase in brackets: Federal Republic of Germany, 1.4 million tons (6 %); Italy, 800 000 tons (14 %); France, 790 000 tons (8 %); Belgium and Luxembourg, 160 000 tons (21 %); Netherlands, 85 000 tons (7 %).

Germany's rate of expansion was based largely on home demand: though remaining the largest EEC exporter her export sales increased relatively slowly (especially to countries outside the Common Market.)

The picture was similar for Italy; the high rate at which production and home demand increased can be explained, as will be described later, by the fact that Italy was rapidly making up for lost time. The high rates of increase in Belgium in this period are partly due to exceptional factors such as the construction of large steelworks and other plants. In France and the Netherlands the general EEC trends described above were more marked than elsewhere; the notable rise in imports was accompanied by a drop in exports as a result of home demand increasing faster than production.

An examination of the various factors governing demand for the various types of heavy metal structures by user sectors in the Common Market as a whole (industry, services, agriculture, public works and civil construction) as projected in the available long-term studies, suggests that internal demand will continue to increase at an average annual rate of at least 8 % up to 1970 and at least 7 % up to 1975. On this assumption the internal demand for this sector would exceed 4.5 million tons in 1970 and would reach 6.4 million tons in 1975.

Assuming that EEC exports to other countries will cease to drop (due more to a stabilization of French and Dutch exports than to any further rise in Italian, German and Belgian exports) and assuming that growth of imports will settle down to reasonably normal levels, it seems likely that overall Common Market production will tend to keep pace with internal demand over the next few years.

On the other hand it is unlikely that trade between the member countries can keep up the exceptional rate of increase registered in the past, even though further considerable increases are foreseeable. What is more probable is that the structure of this trade will change; there are signs that, in certain types of heavy structural steelwork, the more highly industrialized countries and regions are tending to obtain less specialized and less profitable structural steelwork from outside.

In contemplating the creation of a new plant for the manufacture of heavy metal structures, which is to be competitive at home, in the Common Market and on export markets in general, it is of interest to note the production figures of the biggest plants of this type in the Common Market at present. The largest is in the Federal Republic of Germany, with a capacity of 600 000 tons annually. Then there are at least 3 plants in Germany, 2 in France and 1 in Belgium with an annual capacity of around 250 000 tons, and about a dozen (only 2 of which are in Italy) producing over 50 000 tons annually.

The market for heavy metal structures in Italy

Of the three largest producing countries in this field in the EEC the greatest signs of market expansion are shown by Italy (see Table 4.1.8.II) as witnessed by the following figures for average annual rates of increase: production 14 %; imports 90 %; exports 8 %; home demand 18 %. In terms of output, exports and home demand Italy was slightly ahead of France and second only to the Federal Republic of Germany.

In 1963, overall demand in Italy reached 883 000 tons, consisting of 787 000 tons for the home market and 96 000 tons for export. This demand was met by a production of 800 000 tons, the deficit coming from imports (83 000 tons).

The estimated breakdown of production for 1963 is as follows, in thousands of tons: sheds 480; prefabricated building components 80; bridges and overpasses 35; miscellaneous 205. The corresponding percentages are 60 %, 10 %, 4 % and 26 % (see Table 4.1.8-II).

This estimate is based on a direct survey conducted by Italconsult among the firms which account for over 80 % of national production, together with an indirect evaluation made from the number and average capacities of the remaining producers.

Exports took up 12 % of the 1963 production, made up as follows: 40 % electric pylons (Italy being one of the world's main producers in this field), a similar figure for other miscellaneous metal structures, the remainder consisting of metal sheds, etc.

Only a small proportion of these exports (7 %) went to other Common Market countries (principally Germany), the bulk going outside, viz: EFTA 8 % (almost all to Switzerland); 7 % to Mediterranean countries; 5 % to other African countries; 17 % to the USA; 16 % to Latin America; almost 40 % to Australia, the Near and Middle East and (to a lesser extent) other Asian countries.

As regards imports, which met over 10 % of home demand, 37 % came from other Common Market countries (mainly Germany and France), 30 % from EFTA (mainly Austria) and 31 % from the USA. It should be stressed that imports ran at an exceptional level in 1963 due to the construction of such important plants as the number 4 iron and steel works at Taranto, which required large imports from the USA and Austria of sheds and miscellaneous heavy metal structures for the industrial plant and installations. The 'normal' figure for 1963 imports would work out at not more than 27 000 tons (thus actual 1964 imports totalled 23 000 tons, including 34 % from the EEC, 26 % from EFTA and 28 % from the USA).

In view of the exceptional nature of the above level of imports, Table 4.1.8.IV gives the corresponding 'normal' levels, with an estimate of the normal home demand for 1963 (the actual figure of 787 000 tons would represent a 'normal' demand of 731 000 tons).

In view of the relatively small influence of foreign trade, the breakdown of home demand in the table by major groups of heavy metal structures reflects the pattern already given for production. Sheds show a slight increase (64 % of the total) and miscellaneous metal structures a decrease (20 %), while the position of prefabricated building components (11 %) and bridges and overpasses (5 %) is virtually unchanged.

A more detailed study of 'normal' home demand for 1963 by groups of products is given in Table 4.1.8-IV. Out of a total demand of 470 000 tons for metal sheds, industry accounted for 70 %, services about 25 % and agriculture only 5 %. Of the 79 000 tons of prefabricated building components the bulk likewise went to industry (60 %), while over a third went to public building (including schools) and only 6 % to private building. 80 % of the 33 000 tons of metal bridges and overpasses went to road making and the rest to railway works. Lastly, if we exclude the 15 000 tons of electric pylons, most of the 149 000 tons of miscellaneous heavy metal structures was absorbed by the industrial plant industry, etc.

By means of the direct survey conducted among manufacturers, combined with a study of customer location, it was possible to analyse internal demand in Southern Italy and the islands (excluding Sardinia). The results for 1963 are shown in Table 4.1.8-V adjusted to 'normal' levels, i.e. discounting the exceptional demand which, in point of fact, was registered in Southern Italy.

In normal times the South (excluding Sardinia) would account for 226 000 tons of heavy metal structures, or 31 % of national demand; in terms of product groups the percentages are 30 % of all sheds (50 % of agricultural sheds), 33 % of prefabricated building components (40 % of the total for public works and 20 % of the private total), 36 % of bridges and overpasses and 30 % of miscellaneous heavy metal structures.

The entity and distribution of internal demand in Southern Italy as compared to the figures for the country as a whole and for Northern and Central Italy reflect the still limited industrial investments in these areas (apart from a few isolated industrial concentrations) and the agricultural modernization which is going on in the South, as well as the continued effort by the public sector to bring infrastructures up to date.

Passing now to the question of competition in Italy one may note the large number of establishments, the majority of them small or medium-sized.

In 1963 there were over 500 enterprises making heavy metal structures, of which only 6 % in the South. Only a score of these concerns had a capacity in excess of 10 000 tons per year, namely: one of 100-150 000 tons in Central Italy (still being completed at the time), one of 80 000 tons in Northern Italy (specializing mainly in electric pylons, being responsible for almost the entire Italian output in this line), 3 of 30 000 tons and 3 of 25 000 tons, all in Northern Italy, and one of 20 000 tons in the Naples area. Some of these plants also turn out other products such as boilers, boilerhouse plant and cranes but the figures for these have not been included in the output capacity. Then there are a dozen plants, mainly located in Northern and Central Italy, with a capacity of 10-15 000 tons a year and about 50 plants in the 2 000-5 000 ton range. The remaining establishments—over 100 of them—produce about 1 000 tons a year. The small firms in particular (and a few of the medium ones) produce both light and heavy metal structures.

Most of the small firms do installation work as well as manufacturing, and the same applies to some of the medium and large firms. The remainder leave the work of erection to firms specialized in this field, which are statistically classified as installation firms.

In 1963, in the combined regions of Basilicata and Apulia, there were four plants producing both heavy

and light metal structures (in addition there are about 15 firms making light metal structures). The biggest of these plants was in the pole area at Bari and had a payroll of 120 (including some erection workers) and a capacity of perhaps some 5 000 tons a year (see section 2.1). It should also be noted that in Southern Italy, shipyards and certain metal manufacturing concerns often make heavy fabricated steelwork; in the area of the pole this applied, on an occasional basis, to the two steelworks at Bari and Giovinazzo and the shipyards at Taranto.

Since 1963 a number of new enterprises have to be added in North and Central Italy, and more particularly in the South. First of all, the largest of the Italian plants mentioned above has been completed and its capacity has been raised to about 150 000 tons annually. In Southern Italy the additions are mostly small, only 3 of them being capable of 10-15 000 tons, while the above-mentioned plant near Naples has been expanded. In the area of the pole there are three new enterprises at Taranto; two of these are already producing (one with a capacity of some 7 000 tons a year) and one is nearing completion. The output is of mixed light and heavy type. Unhappily the vigorous growth of the sector which triggered off these new developments has largely been halted for the time being, due to the economic recession which set in during 1964 and lasted into 1965. The increase in capacity during this period has aggravated the difficulties of operation for all enterprises in this field.

Leaving aside the economic crisis, a thorough study of the structure and competitiveness of the heavy metal structures industry in Italy must deal with the techniques, organization and methods which can be adopted for different scales of production, as well as the main factors governing variations not proportionate to changes in scale. In this connection we have already noted in section 4.1 that while the labour required to prepare assemblies and sub-assemblies for the various types of mechanical construction increases in proportion to output, it is possible to cut the cost of making components by programming with special production equipment. If special machinery (combined machines which can be set for cutting, butting, and multiple or pitch drilling) is used instead of general-purpose machinery preparation costs can be cut considerably.

This has proved to be economically desirable when production of welded steelwork (sheds, prefabricated building components, most miscellaneous heavy metal structures, etc) exceeds about 25-30 000 tons a year (1). Above this level, with the machines at full load, the unit cost of preparation remains practically unchanged; the cost is affected only by the frequency of machine setting, and this obviously decreases as volume of production rises (in the case of an annual output of 100 000 tons as compared with one of 50 000 tons for example this difference has practically no effect on the total cost of the product).

Furthermore, with an output of the order of 25-30 000 tons a year it is economically possible to have a highly specialized technical department which is one of the prerequisites for achieving low costs and good quality.

Less than ten of the existing plants in Italy (which account for 50 % of output) are big enough to apply the methods and equipment described above and are thus capable of being truly competitive in the Common Market and outside. In Southern Italy there are only two plants big enough, and these are borderline cases. In practice, production is organized along these lines in only a few of the largest Italian concerns.

In Italy not many of the large concerns making heavy metal structures are potentially capable of supplying sheds for large industrial plants etc. on internationally competitive terms as regards time of delivery and speed of final erection—a capability which enables them to operate on a national scale. These concerns are located in North and Central Italy.

In addition, over much of the Italian market, and particularly in the South, special conditions obtain. A number of the large and medium concerns making metal structures belong to big groups which channel to them all the orders from their associated enterprises, and this amounts to about half their total output. In other cases it is the source of finance which indirectly channels orders to certain manufacturers.

Where conditions of free competition really do apply (i.e. over part of the home market and in the export market except insofar as concerns metal structures for industrial plant installed abroad by certain Italian enterprises etc.) the manufacturer has to absorb the differences in the cost of transport to the various regions so that prices tend to be levelled out over the national market (this cost may be put at up to 5 % of the value of goods supplied in Italy).

Road transport costs for a factory in the northern industrial triangle amount to 5 lire/kg for North and Central Italy and almost 10 lire/kg for Southern Italy. Generally speaking, road transport is preferred to rail because of the quicker delivery time and the smaller risk of damage in transit. The average price for sheds (excluding erection) is around 175 lire/kg and the price for miscellaneous heavy metal structures about 210 lire/kg.

Average fob prices for the overseas market are about 150 and 180 lire/kg for the aforesaid two groups of products, allowing for the export bonus and the indirect tax rebate (15 lire/kg and 7.2 %). Transport costs, for the manufacturer, from the factory to the port of loading average around 5-6 lire/kg (for a factory near the port of loading the cost of transport on board ship, including hire of port lifting equipment, comes to 2-3 lire/kg). It should be noted that when the manufacturer bears the transport costs

(1) For rivetted steelwork (bridges and overpasses) the corresponding level is much lower at about 5 000 tons a year.

these amount to 18-20 lire/kg in the case of Mediterranean countries or the Near and Middle East. Average export prices to Common Market countries are 155 and 180 lire/kg for the two groups, allowing for the aforesaid rebates and a smaller bonus. Average transport costs from a factory in the northern industrial triangle to the Common Market countries are about 15 lire/kg.

The foregoing data stress the advantages possessed by factories in the North as regards exporting to other Common Market countries and the similar advantages of factories situated near ports, especially in Southern Italy, when it comes to shipping structures abroad, particularly to the countries around the Mediterranean or in the Near or Middle East.

Projections of home demand, foreign trade and national production for the years 1970 and 1975 are given in Table 4.1.8-V, referred to the normalized level for 1965.

In this connection it should be mentioned that because of the economic crisis the actual level of home demand in 1965 was over 30 % lower than in 1963. Imports dropped drastically, while exports made a considerable jump thanks to the efforts of Italian manufacturers to offset the effects of the crisis on their normal output (this rise in exports was achieved by accepting big cuts in profit margins). Nevertheless, output was more than 25 % down on the 1963 level.

The adjusted normal level for 1965, which is used as a basis for the projections and is shown in the aforesaid table, is still 10 % below the corresponding normal level for 1963, despite the allowance made for the setback of the crisis. This is due to changes of a structural nature which could not be overlooked. The period of recovery will undoubtedly mark the start of a new leap ahead, though the starting point will be below the peaks attained during the boom years of the last decade. This applies to the industrial sectors in general rather than to agriculture and services. It is for these reasons that the 1965 'normal' levels of demand by industry for heavy metal structures are given in the table as being 15-20 % lower than in 1963. As regards foreign trade in 1965 the figures have been adjusted to normal levels by discounting the notable swings which took place as a result of the crisis alone.

Specifically, these projections are based on the correlations derived from past statistics for demand and output of relevant user sectors (industry, services, agriculture) and on certain figures for public and private investment (public works, private building, etc.). An independent variable is also included to cover trends reflecting substitution effects and the insufficient breakdown of the statistics considered.

These trends considerably influence the projections for prefabricated building components and also appreciably affect the projections for sheds and miscellaneous heavy metal structures. As regard sheds, the trend factor is to be attributed not so much to a swing from prestressed concrete structures in favour of metal structures as to a general increase in the demand for sheds made of all materials, due to various independent factors. In effect it is believed that the factors governing the choice between prestressed concrete and metal for prefabricated units and sheds, especially in industry, will remain more or less unchanged in the next ten years (1).

The causes of these trends in the matter of sheds for industry and services are to be sought primarily in the steady increase in the requirements for storage space—which is one aspect of the Italian economy's overdue progress towards a modern commercialized structure.

Similar arguments apply to agricultural sheds, which are increasingly in demand due to the development of hothouse cultivation, agricultural mechanization (machinery sheds) and the growth of animal farming (stabling and other animal sheds).

The trend in prefabricated units for public works and private building reflects the increasing headway made by metal structures in a field which was once dominated by reinforced concrete, especially as regards certain types of building (schools, large office blocks, etc.)

With regard to miscellaneous heavy metal structures, the independent variable representing trend is the result of the increasing use of fabricated steelwork to make beds and standards for certain types of plant and machinery which in the past were of iron or steel castings, and of the use of welded structures instead of steel castings in the manufacture of casings and buckets (2). Another reason is the growing tendency of plant manufacturers to have welded units, etc., assembled in a factory making metal structures.

The correlations in question have been drawn from statistics of the last ten years. For their use as independent variables in the projections for 1970 and 1975 we have adopted the data envisaged in the economic development programme for the next five-year period, suitably extrapolated, and in certain cases modified for the sake of caution. In terms of rates of expansion these are: industry 6-7 %, services 4 %, agriculture 2 %, public works 2 % and private building 4 %.

From the above correlations the rates obtained for the increase in home demand over the country as a whole are as follows: sheds 10-11 %, prefabricated building components 7-8 %, bridges and overpasses

(1) The points in favour of metal structures are speed of construction in any climate and any season, ease of structural changes and possibility of partial re-use. Points against are the increased maintenance compared to concrete structures (which, however, are not easy to modify or re-use) and their unsuitability for industries in which fumes and acids, etc., are present. This latter obstacle has not yet been completely overcome by combining metal with other building materials.
(2) The advantages are lower weight, speed of work and lower cost (elimination of patterns, etc.).

2 %, miscellaneous heavy metal structures 9-10 %, giving an overall figure of 10 % as against 18 % for the period 1959-63 (see Table 4.1.8-IV). For Southern Italy taken separately, as will be seen later, we have adopted slightly higher rates in view of the official policy in favour of developing this area.

On the basis of the calculations, the level of home demand for heavy metal structures in Italy will exceed one million tons in 1970 and 1.7 million tons in 1975. In that year the demand for sheds will be nearing 1.2 million tons, prefabricated building components should reach 150 000 tons and miscellaneous heavy metal structures 360 000 tons. Bridges and overpasses will be at about their present level. The biggest increases will therefore be in the demand for sheds, followed by miscellaneous products and prefabricated building components. About 70 % of the home demand in 1975 will be for sheds, followed by miscellaneous products; demand for prefabricated components will have dropped 10 % and demand for bridges and overpasses will be virtually nil.

The increases in home demand for heavy metal structures in the five-year periods 1965-70 and 1970-75 are estimated at about 380 000 and 670 000 tons respectively.

As regards the outlook for Italian exports it has been assumed that these will expand by 7-8 % (maintaining the ratio between production and exports which held good before the present economic crisis) and that imports will increase by 1 %, even though the trend actually seems to be towards a decline.

Production figures have been projected on the basis of home and foreign demand, giving a result of 1.2 million tons for 1970 and 1.9 million tons for 1975. This means a rate of increase of 9-10 % for the entire period under consideration as against 14 % for the period 1959-63, which succinctly testifies to the conservative nature of the forecasts.

Table 5.2.1-IV shows the projected demand for Southern Italy alone (excluding Sardinia). As will be seen from the rates of increase and the percentages in relation to the national demand, the estimated effects of the development programmes for Southern Italy have been kept within realistic limits. While home demand in North and Central Italy is estimated to increase at the rate of 9-10 % the figure for Southern Italy is put at only slightly higher than 10 %, with the share of national demand rising from 31 % to 33 % in 1975.

Home demand in Southern Italy is estimated to reach over 340 000 tons in 1970 and 560 000 tons in 1975 as against 700 000 tons and almost 1.2 million tons in Central and North Italy in these years. Nevertheless these increases and totals are considerable ones for Southern Italy, and they justify the interest taken in the creation of a plant to manufacture heavy metal structures in the South which is potentially capable of winning a share of the market in Central and North Italy and abroad.

Specifically, the increase in demand in Southern Italy over the next five-year period is put at around 130 000 tons, and at almost 220 000 tons over the subsequent five years. This represents an increase of 90-160 000 tons for sheds (170-320 000 tons in North and Central Italy), 25-45 000 tons for miscellaneous heavy metal structures (50-90 000 tons in North and Central Italy) and 10-15 000 tons for prefabricated building components (20-30 000 tons in North and Central Italy).

Market on which the new unit can count and its size

The factors which have been taken into consideration in determining the potential market share are: the competitiveness of the new enterprise; the prospects for exporting to certain geographical areas; the existence of other large plants in Italy, and their planned extensions; the limits on competition imposed by special relationships between some major producers and certain customers in Italy; the projections made and other data analysed above. On the basis of the foregoing, the volume of sales which the new unit can expect to achieve is about 50 000 tons per year at a conservative estimate. Of this total 35 000 tons would be for the home market (27 000 for Southern Italy and 8 000 for North and Central Italy) and 15 000 tons for export.

These output figures would be achieved when the unit is running 'normally'. Under the general programme covering the whole system of projects for the pole the intention is for production to start up in 1969, with full production being reached in 1971. The date could be brought forward by one year if the plant in question had to construct sheds, etc., for the other new units in the pole (these requirements are estimated at over 30 000 tons).

Normal production levels and distribution of sales might be put as follows, in thousands of tons per year:

	Home market			Exports	Total output
	Total	North- and Centre	South		
Sheds	24	5	19	10	34
Prefabricated building components	4	1	3	—	4
Bridges and overpasses	—	—	—	—	—
Misc. heavy metal structures	7	2	5	5	12
Total	35	8	27	15	50

On the home market these figures would represent about 3 % of national demand in the period 1970-75 (split geographically into 6 % of the demand in Southern Italy and 1 % in North and Central Italy). Even admitting that 50 % of the market for certain metal structures and in certain sectors would be closed to the new unit, these percentages are still extremely modest ones as regards North and Central Italy and feasible ones for Southern Italy inasmuch as the unit would mainly be competing on favourable terms there.

In practice it will not be necessary to capture any of the existing market. The output figures given above represent no more than 6 months of the annual increase in home demand predicted for the period 1970-75 in Italy, bearing in mind that the combined total of home demand and exports will have outrun the present production capacity by 1970. As regards Southern Italy alone, the estimated sales of the new plant are far below the annual increase in demand predicted for this area in the five-year period. Even assuming, for the reasons given earlier, that 50 % of the market will be closed to the new plant, its national sales would still only be equal to one year's increase in demand.

It should also be noted that bridges and overpasses have not been included in the share of the home market on which the new unit can count, due to their limited prospects for expansion and to the fact that they are already catered for by members of the IRI group, which is building most of the big new highways. In addition, the figure for miscellaneous heavy metal structures excludes electric pylons, since these, as already stated, are the speciality of a large firm of international repute.

Lastly, as regards the total home market on which the new unit could count it should be stressed that, allowing for the regional differences in transports costs, sales in Southern Italy should exceed 75 % and sales to Central and Northern Italy should be less than 25 % (the corresponding distribution of sales for factories located in North and Central Italy is about 70 % to those regions and 30 % to Southern Italy).

With regard to exports, the reason for designing the unit to such high standards of productivity and competitiveness was precisely so that it could operate on the export market. Foreign sales will mainly be directed towards countries in the Near and Middle East and around the Mediterranean, the balance going mostly to Common Market countries. Bearing in mind the limits of the present study one could say, in broad terms, that the first group of countries would take about 10-12 000 tons and the Common Market countries under 5 000 tons.

At this stage it is impossible to say whether the entrepreneur would favour erecting the sheds on site or whether he would have this done by specialized firms. For certain Italian and foreign customers it is likely that the factory would not erect the sheds—considering the fact that when firms do carry out this work it is not so much for the additional profit involved as in order to ensure that the job is properly done (erection firms are paid at the average rate of 18 lire per installed kg, and their work is not always up to standard.

Unit II

FOR THE PRODUCTION OF SHEET-METAL COOKERS, BATH TUBS AND RADIATORS AND ENAMELLED STEEL HOLLOW-WARE

The market for cookers in the EEC

The Community market for sheet-metal cookers of all types showed an overall growth rate of 2.5 % per annum from 1959 to 1963.

The foreign trade statistics of the majority of member countries do not make it possible to distinguish cookers from domestic heating appliances, at least, not for all types. It is estimated that exports of metal cookers from the EEC to third countries in 1963 exceeded 200 000 units and that they must have grown faster than the internal demand of the Community.

However, some idea of the market can be obtained from the production data for the years indicated:

Countries	1959 ('000 units)	1963 ('000 units)	Mean annual growth rate %
Benelux	217.6	254.6	4.0
France	722.0	907.5	5.9
Germany (F.R.)	2 036.0	1 903.1	— 1.7
Italy	756.0	1 055.0	8.7
EEC	3 731.6	4 120.2	2.5

These figures show that Community output of metal cookers had reached 4.1 million by 1963. Distinguishing by types (see Table 4.1.8 - VI), 37 % were gas cookers, 29 % electric and mixed cookers, 29 % wood and coal cookers, and under 5 % diesel or kerosene cookers. The greatest producer of gas cookers was Italy, which contributed almost one half to the production of the Community followed by Germany (FR) and France. Over 72 % of the electric and mixed cookers were produced in Germany and a considerable fraction of the remainder in Italy. The production of wood and coal-burning cookers was attributable mainly to Germany (FR) (56 %) and to France (32 %).

Among member countries, production of cookers of all types increased at very different rates during the period. In Germany (FR), the largest producer, with 1.9 million cookers, a reduction was observed during the period of study; only since 1963 has the level of production displayed signs of recovery, to near the

levels of 1959. In particular, there was a net reduction of 12 % in the production of gas cookers, and of 3 % in wood and coal-burning cookers; on the other hand, increases were observed in the production of electric cookers (growth rate 3 %). This trend is attributed to the lowering of electricity tariffs, and above all to the preference on the part of the consumers for automatic cookers, and hence for the last-mentioned type (1).

In Italy the production of cookers of all types had already exceeded 1 million units in 1963, and the growth rate for production was almost 9 % per annum.

In France production was approximately 908 000 cookers, with an annual increase of 6 %. This expansion, contrary to the trend described for Germany (FR), was attributable to gas, oil-burning and electric cookers.

In the Benelux countries, in 1963, total production was over 250 000 cookers; this had increased at a rate of 4 % during the period.

The largest unit for the production of cookers is located in Germany (FR), and has an annual production of 400 000 cookers; the second largest producer is in Italy with 170 000 cookers. Units having a production of 100-150 000 cookers annually are to be found, one in Germany (FR), three in France, and the same number in Italy. A considerable number of smaller units are distributed among the various countries of the Community; these include some with an annual production of 30 000 cookers. The majority of the large undertakings, except for a few, including the largest undertaking producing mainly electric cookers, make cookers of the various types.

For an adequate assessment of the production figures, it should be borne in mind that, from studies carried out for the purposes of preparing the present report, it would appear in general that the dimensions which would permit an undertaking to operate competitively at an international level, and in particular on the EEC market, are 70-80 000 cookers annually; undertakings having lower production would not easily be able to withstand the competition from the larger producers at medium and long term.

Competition between producers and distributors on the EEC market is fairly keen, in terms of both prices and quality. In a few member countries, special technical standards have recently been introduced or are being introduced for the construction and use of cookers of various types; by virtue of the conditions of application, this has the effect of indirect protection of national production, at least for a certain period.

(1) In the years following 1963, the drop in production of traditional wood and coal burning cookers accelerated, while the decline in gas cookers slowed down. In the case of electric and mixed cookers, an increase of about 4 % on the former contrasted with some stagnation of the latter.

With regard to the forecasts of production in the EEC, it is to be expected, taking into consideration the factors of long-term demand, that production itself will be able to develop at higher rates in the period previously considered: 4-5 % over the whole of the next decade.

In particular, production should increase continuously by 3-4 % per annum in the Benelux countries, and 6-7 % in France, mainly in the field of gas cookers; 1-2 % in Germany (FR), originating chiefly from electric cookers; and lastly, 7-8 % in Italy. These forecasts take into account, not only internal demand, but also sales to third countries, which should increase by not less than 3 % per annum.

According to these forecasts, Community production would increase from 4.3 million cookers in 1965 to 5.5 million in 1970 and to 6.9 million in 1975. The total increase in production might therefore be approximately 1.5 million cookers in each of the next two five-year periods. Taking the "low" instead of the "average" estimates, the production forecasts based on a 3 % annual increase would give a level for 1975 of 5.8 million, and the five-year increases indicated would then still amount to over 700 000 cookers.

The market for cookers in Italy

The market for metal cookers in Italy grew at a mean annual rate of 8.1 % over the period 1959-63. Overall supply practically coincides with internal supply and with production, as imports are insignificant; overall demand, on the other hand, has exhibited this growth rate, both as a result of the expansion of internal demand, and, still more, due to that originating from abroad, as is clear from the following data:

	1959	1963	
	('000 units)	*('000 units)*	Growth rate (%)
Production	756	1 055	8.7
Imports	5	5	—
less Exports	95	150	12.0
Internal demand	666	910	8.1

As already pointed out, in 1963 Italy was the second largest producer of metal cookers in the Community, and first in the case of gas cookers (700 000 units), following the Federal Republic of Germany although at a considerable distance, in the production of electric and mixed cookers. Amongst the large producing countries, Italy had the smallest production of traditional wood and coal burning cookers (120 000).

This structure of production reflected mainly a strongly expanding internal demand, characterized at

regional level by a preference in the north for gas cookers, in the Mezzogiorno for mixed cookers, and in the centre, more specifically in Tuscany, for exclusively electric cookers. The higher growth rate as compared with all other member countries reflected basically the improved living standards and the piping of liquid gas to the whole country. No less important was the effect of a considerable reduction in the price of metal cookers as compared with that of ranges.

Only one third of exports went to Community countries—chiefly to France and to Belgium—and a good two thirds to other countries, especially round the Mediterranean (Greece, Spain, Yugoslavia, Lebanon, etc.). The impetus of exports, which was the most vigorous in the EEC, was attributable to the very high competitivity achieved by the largest Italian firms in the sector.

In 1965, it is estimated that production will touch 1.2 million cookers, of which over 920 000 will be absorbed by internal demand, and 240 000 by exports. The growth of demand appears to have slowed down temporarily during the last two years as a result of the economic recession and of adjustment processes. Whereas exports to third countries have recorded a fresh strong upswing, those to member countries of the EEC are believed to have risen more slowly (4 %) due to the negative factors referred to earlier.

As regards internal supply, there are in Italy approximately 90 producers of cookers of various types, including 25 with over 250 workers, but only 6 with an annual production of 30 000 cookers and over: one undertaking with 170 000, two with 80-90 000, one with 75 000 and two at the limit stated. None of these large units is located in the Mezzogiorno (one undertaking of a large firm in the sector produces refrigerators, wash basins and component parts at Naples), but important projects are said to be at present afoot in that region. None of the largest producers combine the production of cookers with that of domestic electrical appliances, sanitary ware or sheet-metal radiators. It should be observed in this connection that not all the undertakings have their own enamelling shop, so that their combined lines are concentrated on painted products such as dish-washing machines, washing machines, bath heaters, etc.

In general it can be said that, during the last few years, the normal capacity of producers of metal cookers was used to 90 % and over and that, except for the present economic situation, there is still a considerable market not fully covered by supplies. One of the reasons on the production side is that subsidiary enamelling shops are not big enough and on the marketing side that the sales system is changing rapidly. Furthermore, it is a fact that the entire structure of production and distribution on the internal market is conditioned by the existence of intense competition, which is the keenest to be found in the markets of central and eastern Europe.

Among productive aspects, it is interesting to note that models are frequently modified, especially as regards outside appearance, for the purpose of stimulating demand; consequently the moulds and assembly jigs have a useful life of 3-4 years.

Among marketing aspects, it should be emphasized that the organization of sales by the larger producers has tended towards the creation of their own depots in the larger Italian centres, staffed by their own personnel with the task of supervising retailers, and of giving technical assistance (a few of the large producers have retained a mixed system of depots and agents).

Prices to retailers on the internal market correspond to the list prices less approximately 40 %; the list price for a mixed cooker of the "medium" type (4 burners, 1 hot plate) is approximately 63 000 lire, and the wholesale price to retailers around 37-38 000 lire. This price includes the cost of transport, including packing. The transport price is on average 1 000-1 100 lire per stove from the industrial triangle to the southern mainland, and 300-350 lire on average for the centre and north; these costs relate to transport by trailer lorries, and to rates for regular deliveries ([1]). The corresponding packing, generally crates with cellophane or crates with boxes, costs on average 2 000 and 3 000 lire per cooker, respectively (the first type of packing is the one most in use).

For transport by sea, the packing consists of a close-boarded crate, box and expanded materials (polystyrene, polyurethane), and costs on average 4 000-4 200 lire per cooker. Sales abroad are generally quoted fob. This price is slightly lower, by 2-4 %, than the internal price (35 to 36 000 lire for a cooker of the "medium" type); the cost for transport by rail to the landing stage, at producer's cost, is on average 550 lire per cooker (from the Milan area to north Italian ports). Taking into account that exports benefit from the premium and refund of the IGE, the return for the producer is almost equivalent to that of internal sales, or slightly higher (again with reference to the "medium" cooker, 37-38 000 lire).

The market forecasts for Italy for 1970 and for 1975 are summarized in Table 4.1.8 - VIII; the year 1965 has been taken as base year for reference.

For the purposes of these forecasts, an estimated breakdown of the number of metal cookers in Italy in households, communal dwellings, etc. (see Table

([1]) For an undertaking located in the Milan area, the transport prices for deliveries in the same area are relatively high, 170 lire per cooker of medium type. The rate is over 260 lire from the aforesaid area to Turin, approximately 500-650 lire for the consumer centres of north-eastern Italy and central Italy as far as Tuscany, 860 lire for Lazio, 1 000-1 100 lire for Naples and Bari and over 1 400 lire for Sicily. Transport from the Milan area to Sardinia for a medium type cooker amounts to around 2 150 lire, including sea transport. A lorry and trailer with a capacity of 21 metric tons can transport 140 cookers.

4.1.8 - VII) has been made on the basis of the partial results of various studies and enquiries which are available and of information supplied by producers and experts of the sector. The number in households was calculated by regions and by communes with a resident population above and below 20 000 inhabitants. The internal demand in that year was also broken down by classes of users, and their geographical distribution.

The figures so obtained indicate that, in the whole of Italy that year, approximately 58 % of families had a metal cooker, while the others were using ranges, cast iron cookers and other traditional and obsolete means; in the centre and north, 82 % of families were using metal cookers in communes with over 20 000 inhabitants and 63 % in those with under 20 000. In the Mezzogiorno, these percentages fell respectively to 36 and 25 %. Still in the same year, the internal demand involved chiefly families and only 2 % was for communal dwellings and public services; in terms of weight and size of the cookers, the demand from communal dwellings and from services was however greater than 5 %. Of the total demand, 28 % originated in the Mezzogiorno (almost 26 % excluding Sardinia). Lastly, of the total internal demand, slightly over one third came from increased numbers and the rest were replacements, although it should be noted that, in the reference year, the increase in the number of cookers installed had temporarily slowed down as compared with previous years, and that "normal" replacement demand—certainly higher than the figure recorded—was calculated on the basis of an average life of 10 years, in fact on the level of the corresponding year. In terms of numbers in use in 1965, replacement demand corresponds to 7 %.

In forecasting internal demand originating from households, account was taken of requirements for renewal and replacement, together with the expected increase in population, in income and in the replacement of ranges, etc., by metal cookers—a trend which is also favoured by the progressive reduction in the price difference between cookers and ranges and further considerably influenced by the psychological effects of emulation. This process of substitution is changing the structure of demand, and although in a first period linear analytic relations were calculated between the number of cookers and the number of households, per capita income, average relative price of the cookers and a variable representing the trend of substitution and other factors, it had to be recognized that the coefficients obtained, based on old statistical series, could not be used for more realistic forecasts. It is a hard fact that, in the near future, the price of cookers will equal that of ranges with relevant accessories (1), and that producers will tend to concentrate on the exclusive production of cookers for the internal market; in this context, a decisive role will be played by the above-mentioned psychological factors whose tempo and effect in precise terms of time cannot be assessed.

According to "high" assumptions, it could be argued for practical purposes that in 1975 virtually all households will have a metal cooker, even if the process of substitution takes place more slowly in communes with less than 20 000 inhabitants, and especially in the Mezzogiorno. The "average" assumptions which take account of elements of resistance to this process, consider that the percentage of households with metal cookers will reach 86 % in the whole of Italy in 1975, including 95 % in the centre and north in communes larger than 20 000 inhabitants and 80 % in the other communes, and 90 % and 75 % respectively in the Mezzogiorno. The average life of cookers towards the end of the period is assumed to be down to 7 years, taking into account the design characteristics of current production (in 1975 replacement demand is likely to be approximately 10 % of total numbers for the year considered).

As regards forecasts of demand from communal dwellings and public services, other than for purposes of replacement, forecasts of population growth were considered for the former, and forecasts of development of the relevant activity for the latter.

The results given in Table 4.1.8 - VIII show that the level of internal demand is likely to increase by 8-9 % annually during the period, and consequently will exceed 1.4 million cookers in 1970 and 2.1 million in 1975, including 465 000 and over 900 000 respectively in the Mezzogiorno. In analysing the growth rates for households living in communes with less than 20 000 inhabitants, it was taken into account that during the period their number will tend to decline slightly in the centre and north and to remain virtually stationary in the Mezzogiorno.

Allowing for a substantially lower growth of exports (3.5 % per annum) both to EEC (2 %) and to the rest of the world (4 %), Italian production is likely to reach 1.7 million cookers in 1970 and almost 2.5 million in 1975, with an annual growth rate of about 8 %.

According to the cautious forecasts made, the production of metal cookers in Italy may therefore expand, in the next 5 years by at least 550 000 units and by 740 000 in the following period. With a view to a subsequent analysis concerning the size of a new large unit to be set up in the Mezzogiorno to come into operation in 1969, a further cautious estimate, assuming more rapid changes in demand, suggests a different pattern of increased production up to a maximum of 800 000 units in the period 1965-1970 and of 500 000 in 1970-1975.

(1) The future price of a cooker with oven will equal the current price of the range with incorporated accessories, and therefore without oven, which represented a transitional stage between the traditional range and modern economical cooker.

The market for sheet-metal bath tubs in the EEC

The lack of production and/or foreign trade statistics for these products in certain EEC countries (the data are aggregated with those for cast iron tubs, and in certain cases even with other sanitary ware) make it impossible to undertake a detailed analysis of the market for them. Amongst other reasons, this paucity of information is due to the fact that production on an industrial scale of sheet-metal bath tubs like that of sheet-metal radiators studied earlier, goes back to comparatively recent times.

However, by supplementing the available data with estimates, it is possible to make an overall appreciation of the productive situation in the EEC in 1963, made easier by the fact that in 1963 production was practically concentrated in Germany (FR) and in Italy. As a whole, the Community's production of sheet-metal bath tubs (standard, with seat, with or without legs) amounted to about 840 000 units in the period 1959-1963, and had increased at a rate of 8-10 % as compared with a growth rate of 3 % for the total production of both cast-iron and sheet-metal bath tubs. Demand for the tubs in question seems to have followed a similar trend. The higher growth rate in production and internal demand for sheet-metal bath tubs must however be attributed, as already stated, to still modest production and absolute levels. In reality, in 1963 the production ratio between sheet-metal bath tubs and cast iron ones was still below 1:5.

The EEC country producing most sheet-metal bath tubs was the Federal Republic of Germany, which in 1963 manufactured over 425 000 (approximately 288 000 in 1959). In Italy in that year industrial production had reached 240 000 units. The remainder of the Community's production was distributed between France, the Netherlands and Belgium.

Foreign trade in this type of tub is thought to have involved, in general, less than 10 % of production. The relevant transactions appear to have related chiefly to inter-community trade. In 1963, Germany is believed to have exported about 25 000 sheet-metal bath tubs within the Community, mainly to Belgium and the Netherlands, covering more than 90 % of their imports.

The production of sheet-metal bath tubs is carried on preponderantly by large undertakings, and to a modest degree by medium-sized units, which operate at less competitive costs, resulting in products which frequently have considerably inferior marketing characteristics. The small and medium-small undertakings have to limit their production to tubs with seats or smaller-angle standard types, because the standard models with 35° slope, require the use of presses and dies which can be economically justified only for large scale production. In 1965, the largest undertakings making sheet-metal tubs in the EEC numbered three, each with a potential annual production of about 240 000 units: two in the Federal Republic and one in Italy. No producers of this order are known in France, where undertakings appear in general to be medium small ones.

In future, the large producers of sheet-metal bath tubs will be competing with each other (1) and increasingly with producers of cast-iron baths as regards price and quality.

It is known that cast-iron baths have the advantage of keeping the water hot longer and that from the production standpoint, even if the price of cast-iron as a raw material is higher than that of steel, casting costs less and the capital outlay is lower. On the other hand, cast-iron tubs suffer from the following disadvantages: there is a wastage in production of more than 30 %, which means that 1.3 tubs have to be cast in order to obtain one sound one; they are very difficult to enamel, particularly in white (porosity, gas seepage, breakages due to vitrification) and reprocessing is necessary for 50 % (average) of the tubs produced; they also weigh more and installation is more expensive since they are again subject to breakage.

Sheet-metal tubs present considerable advantages from the standpoint of production and installation: thinner enamel (2), easier to enamed with a maximum of 15 % reprocessing; quicker firing in the ovens without the formation of cracks; lighter, flexible clamping brackets, simplicity of installation, reduced handling and smaller risk of breakage. On the other hand, as compared with cast-iron, sheet-metal tubs have the disadvantage of faster cooling of the water and higher capital outlay (stamping) as compared with that required for cast-iron tubs (casting). One of the marketing disadvantages which in the past could be attributed to sheet-metal tubs was that, unlike cast iron, they could not have a slope of 35°.

Recent progress in the field of presses and moulds has overcome this disadvantage.

It must however by emphasized, that, on the whole production costs are substantially lower for sheet-metal than for cast-iron tubs. This has enabled the producers of sheet-metal tubs to offer their own products on the market at prices 15-20 % lower than those for cast-iron tubs (prices including packing and transport for both types).

And it is precisely on this aspect of competition in terms of prices that it is reasonably possible to argue that in future the supply of sheet-metal bath tubs may ultimately prevail in the market. Indeed, whilst the margins for producers of the latter are still considerable, those for producers of cast-iron tubs have been progressively diminishing towards limits which can

(1) The demand for tubs with seats etc. constitutes a very small part of the total demand for bath tubs.
(2) Enamel costs on average 245 lire/kg.; normal enamelling on steel requires 40 microns, 18 black and 22 white, whilst enamelling on cast-iron requires from 70 to 75.

hardly be withstood without impairing the quality characteristics of their products.

Bearing in mind the above-described conditions and elements, as well as the particular prospects presented by the development of the economic structure, one may assume that demand for, and production of sheet-metal tubs in the EEC will expand at a rate of at least 7-9 % up to 1975. In that year, production may therefore reach at least 2.2 million sheet-metal tubs, with a total increment of over 1 million units. It is highly probable that such an increment will be fully realized and even exceeded.

The market for sheet-metal bath tubs in Italy

From the results of direct enquiries, it is possible to estimate that in 1963 approximately 740 000 bath tubs were produced in Italy, including 500 000 cast-iron (68 %) and 240 000 sheet-metal (32 %). Whereas production of the former was increasing at the rate of 5 % in previous years, that of the latter had reached an average of approximately 7 %.

Part of the production of cast-iron tubs was processing work for abroad; exports, including such work, were of the order of 90 000 tubs in that year. Imports consisted chiefly of blanks which were converted by the Italian industry of the sector. Allowing for breakages during distribution and installation (5 %) and for other minor adjustments, net internal demand in 1963 amounted to 380 000 tubs (see Table 4.1.8 - IX).

During the period 1963-65, various projects increased the output potential for cast-iron baths, including a new undertaking in the area of the Naples pole (Salerno) which has recently come into service. The potential of the Italian industry thus reached 650-700 000 units annually (effective normal capacity less than 600 000), assuming second place within the EEC after the Federal Republic of Germany (1.2-1.5 million cast-iron tubs annually). It is estimated that the effective production of cast-iron tubs in 1965 will be restricted to 540 000, 70 % of these being absorbed by the internal market, and the remainder by increased exports (120 000 units) and increases in stocks. Internal demand is down as compared with 1963, chiefly due to the crisis experienced in the building sector. However, it should be observed that although the level of production appears only 8 % higher than that for 1963, value added increased more than proportionally, due to the direct production of blanks previously imported in large quantities.

As regards sheet-metal tubs, foreign trade presents no significant changes, and the production figures quoted practically coincide with internal demand. The sheet-metal tub industry consists largely of 8 producers, 4 of whom have over 250 workers, all located in the north. In 1963 the two largest undertakings each had a normal capacity of approximately 120 000 units annually (as compared with an overall production of over 220 000 units). They combined the production of tubs with various other sheet-metal products (cookers, certain types of domestic electrical appliances and/or central-heating radiators). In 1965, due to the expansion of one of the two undertakings referred to, this capacity reached 360 000 units annually. It is estimated that production will amount only to 320 000 units, taking into account the current limited possibilities on the internal market, and anticipating a modest increase in warehouse stocks. Nevertheless, production in 1965 should be 1/3 higher than in 1963, with an average annual growth rate of 15 %.

It is interesting to note that less than 1/10 of total production of sheet-metal tubs is represented by those of the seat type etc., which are made by the smaller undertakings, but the larger firms could produce if necessary to keep their plant working at full capacity (presses and enamelling plants).

To summarize the data given, in 1965 total production of bath tubs (cast-iron and sheet-metal) will probably reach 860 000 units annually, with a normal capacity of almost 1 million tubs.

Among the most interesting aspects of the distribution of sheet-metal tubs, we find that their marketing system, insofar as the largest producers are concerned, depends upon the organization of depots in the main Italian urban centres, which sell directly to builders and plumbing contractors. The average number of depots for a large unit is around 30, and these are the same as those already mentioned for cookers.

The average selling price to plumbing contractors on the internal market is around 23 000 lire up to 10 tubs, and around 19-20 000 lire for larger deliveries to large contractors and retailers. Prices include packing and transport costs. The former, consisting of a crate and expanded material, costs around 900-1 000 lire per tub. The cost of transport by lorry for an undertaking located in the industrial triangle, and for deliveries to depots in northern Italy, is on average 550 lire per tub, for central Italy 750 lire, and for the southern mainland, 960 lire (1).

The forecasts of internal demand in 1970 and in 1975 for the two basic types of tubs take 1965 as reference year. Table 4.1.8 - X shows the estimate of the total stock of baths in that year, broken down among dwellings and communal dwellings, hotels, etc., and the level of internal demand, with separate figures for the increase due to the installation of tubs in new dwellings, in existing dwellings without baths, in communal dwellings, hotels, etc., and replacement demand, allowing for an average life of over 30 years (taking a rather high estimate for the sake of caution). The internal demand is subsequently detailed by destination, basic types of tub, and geographical areas.

(1) The average cost of transport, including sea transport, is over 1 100 lire for Sicily and 2 200 lire for Sardinia.

The itemized estimates of internal demand were obtained by assuming, on the basis of information obtained from builders and plumbing contractors, that practically all new dwellings have a bath, and, specifically that there are 1.2 tubs per dwelling, in communes with more than 20 000 inhabitants, and 1 tub in communes with less than 20 000 inhabitants. These figures are obviously averages, but there is thought to be little variation; however, they make no distinction between the different forms of tub and therefore include those with seat etc. The respective coefficients were applied to the corresponding figures in the building forecasts worked out for the present study, thus obtaining the number of tubs which will be installed in new dwellings. Similar criteria were applied in order to obtain the number of tubs which would be installed annually in other new buildings.

It is important to emphasize that the estimates refer to a "normal" level of demand which will certainly be higher than effective net internal demand, and that therefore the increases in stocks obtained (see Table 4.1.8 - IX) by subtracting "normal" internal demand from production, may in fact be greater, other things being equal.

Although we are dealing with very broad estimates, it is interesting to note that 75 % of internal demand is due to the increase in the total stock baths, and the remaining 25 % are needed for replacements; when destination is considered, 94 % of the demand relates to individual dwellings and 6 % to communal dwellings, hotels etc. Finally, 45 % of the said demand relates to sheet-metal tubs and 55 % to cast-iron tubs.

In order to obtain the corresponding figures for 1970, slightly higher coefficients for the number of tubs for new dwellings were applied to the corresponding forecast series, to allow for the increase in per capita income and other factors: centre-north, communes above 20 000 inhabitants 1.25, communes under 20 000 inhabitants 1.05; Mezzogiorno, communes above 20 000 inhabitants 1.25, communes below 20 000 inhabitants 1.08. For 1975, these coefficients would become respectively 1.30, 1.10, 1.25, 1.10. The percentage of dwellings expected to have one or more bath tubs in 1970 and in 1975 is shown in Table 4.1.8 - XI. From a current figure of 33 % it should increase for the whole of Italy to 45 % in 1970 and to 57 % in 1975. In the latter year, the proportion of dwellings with a bath in the centre-north would remain: 72 % in communes above 20 000 inhabitants, and 48 % in those with a smaller resident population, as compared with 64 % and 36 % respectively in the Mezzogiorno.

The 1970 and 1975 forecasts of the number of tubs in communal dwellings, hotels, etc., were based fundamentally on the growth rate of the population and of the branch concerned.

As regards the sub-division in these years of internal demand by types of bath, it was assumed that in 1970 55 % of internal demand will be for sheet-metal tubs, and 75 % in 1975. This trend of demand may be even more in favour of sheet-metal tubs, if allowance is made for the expected strong price competition which is likely to develop during the next few years, for the substantially greater competitivity of producers of sheet-metal baths as compared with those making cast-iron types and for the increasing number of cheaper houses.

From a study of Table 4.1.8 - X, it would appear that the internal demand for bath tubs will expand at a rate of approximately 5 %, reaching 830 000 units in 1970 and 1.1 million in 1975. The internal demand for sheet-metal tubs is however expected to increase at a rate of 9 % over the next 5 years and 12 % in the following period, reaching 457 000 units in 1970 and 813 000 in 1975, with an increase of 157 000 in the first period and 356 000 in the next. For the Mezzogiorno only, the figures should be 150 000 and 280 000 tubs respectively, and the increases 56 and 130 000.

On the other hand, the internal demand for cast-iron tubs is expected to remain virtually constant until 1970, and then decrease to 270 000 units, with a reduction of 100 000, by 1975.

The figures show that, if exports of sheet-metal tubs do not exceed 6-7 % of production, and imports remain negligible, the productive level of this industry will rise to 487 000 tubs in 1970 and to 870 000 in 1975; the corresponding increases in the two 5-year periods are expected to be respectively almost 170 000 units and over 380 000 units (see Table 4.1.8 - XII). It is pointed out that the absolute figures forecast for exports have been kept fairly low, on the assumption that sales were likely to be directed less to other EEC countries than to Mediterranean and Eastern countries, whose absorption capacity is limited.

It is clear from the foregoing figures that, taking into account the existing capacities of the sheet-metal bath industry, a fresh increase of approximately 130 000 units per year will be required for 1970, and one of the order of 400 000 units per year in 1975.

The situation for the cast-iron bath industry is different. It will have to meet problems of surplus capacity. Even assuming a reasonable increase in exports, it will be neither possible nor advisable to increase the current productive capacity, since this is more than sufficient to satisfy the overall demand for this product. These problems will become more serious in the years after 1970.

If, contrary to the assumptions hitherto adopted, the production of sheet-metal baths does not expand more rapidly than that of cast-iron types, it will be possible to satisfy the overall demand in Italy up to 1970 without fresh investment even in the former industry, or at the most for an additional output of 50 000 units per year towards the end of the 5-year period. However, even according to these new assumptions, it will be necessary in the course of the following 5-year

period to expand production up to the stated figure of 400 000 units, of which over 170 000 would be sheet-metal baths.

The market for sheet-metal central-heating radiators in the EEC

The production of sheet-metal radiators in the EEC in 1963 was estimated as over 20 million sq.m. of radiating surface. Like sheet-metal bath tubs, this is a relatively recent production which has been expanding over the last few years (1959-63) at a high average annual rate of the order of 15 %.

The production and foreign trade statistics for sheet-metal radiators are extremely fragmentary (the data are frequently combined with those for cast-iron types and other products connected with central heating). It is estimated that, in 1963, the Community's exports to third countries were appreciable and inter-Community trade of substantial importance. According to some experts, total exports from the Federal Republic of Germany amounted to some millions of sq.m.; the combined exports of the remaining member countries were less than 1 million sq.m. and came chiefly from the Netherlands (which, in 1963, exported 667 000 sq.m., whilst importing 150 000 sq.m.).

As for the other lines of the projected unit, an overall assessment of the market for sheet-metal radiators in the EEC has to be obtained from estimates of production in 1963; these data are given below by member countries and expressed in thousands of sq.m. of radiating surface, with the corresponding average annual growth rates referred to 1959:

Countries	Production	%	Growth Rate %
Belgium-Luxembourg	500	2.5	—
France	—	—	—
Federal Republic of Germany	15 340	76.1	17
Italy	1 770	8.8	7
Netherlands	2 550	12.6	14
EEC (1)	20 160	100.0	15

(1) Excluding France.

The largest producer in the Community was Germany followed by the Netherlands and Italy. Belgium-Luxembourg had a limited production. No information is available for that year on the industrial production in France of radiators of the type studied, but it is assumed that, then at least, modest quantities were produced by small undertakings.

The growth of production in the EEC was mainly determined by the German growth rate, although the Netherlands rate of expansion was not much lower. The slower expansion of production in Italy was influenced by greater difficulties in introducing the product on the internal market.

Despite the considerable progress achieved in 1963, the production of sheet-metal radiators in the EEC represented less than 1/3 of the total production of radiators; the high expansion rate reported above (15 %) must be set against the rather lower absolute figures as compared with cast-iron radiators.

Because of the technical and productive requirements for competitive operation in large markets, virtually all the Community production of sheet-metal radiators is concentrated on a few dozen large and medium-sized undertakings. The largest producer is in Germany, with an output of over 2.5 million sq.m. per year; the second largest undertaking is in Italy and at present (1965) has a capacity of 1.5 million sq.m. per year. It must be remembered that the minimum economic size for competitive working is around 150-200 000 sq.m./year.

Competition among producers and distributors of sheet-metal radiators was not very marked in the previous years, owing to the relationship between potential demand and total supply in the EEC. This is not to say that there was no competition in terms of prices, and above all of quality; it must however be recognized that the main competitive pressure came from producers of cast-iron radiators, and from difficulties originating in resistance of central-heating contractors to the new type of radiator.

During the first years of production, although these radiators had the advantage of lower weight and excluded the risk of breakage during transport, storage and installation to which the cast-iron radiators are subject, they also had the disadvantages of "breaking away" and greater liability to corrosion, thus requiring more expensive maintenance, whilst their thermal efficiency was also inferior because they cooled more rapidly than cast-iron ones. It must be emphasized that second and third class sheet-metal radiators, which exhibited these disadvantages to an even greater degree, appeared on the market during these years.

Competition with cast-iron radiators took the form of charging lower prices whilst simultaneously improving quality. These radiators are now generally made of bright steel (1.9 mm) using new projection welding methods to form combined groups or specific elements welding machines which have practically overcome sealing difficulties. It has also been discovered that, although sheet-metal cools more rapidly, it heats up even faster, so that these radiators are more economical in service for non-continuous heating of premises where this is desirable or possible, owing to their purpose or prevailing climatic conditions. This

applies to schools, offices, public services, dwellings in temperate zones (central and south Italy, south of France). Because of their lower relative price, sheet-metal radiators are also of interest for cheap building schemes.

Finally, it may be said that, by and large, competition between the two types of radiators has produced a substantial reduction in market prices; the price of sheet-metal radiators remains lower by about 20 %.

It is expected that due to resistance from traditional preferences, etc. this competition will remain close during the next few years, even for certain uses which should logically go to sheet-metal radiators; but the competitive capacity of producers of cast-iron radiators is unquestionably approaching the limit. Whilst margins for these producers are now small, with the current qualities of the product unchanged, producers of sheet-metal radiators still have substantial margins which can moreover be further increased in the case of large-scale production; they are therefore in a position to make price reductions in future which their competitors will ultimately be unable to match.

In view of the complexity of the elements which will influence the trend of relative prices and the changes in consumers' preferences, it is difficult to set a figure for the internal demand and the production of sheet-metal radiators for the whole of the EEC over the next ten years. Even assuming a small expansion in overall demand, at an annual rate of 6 % until 1970 and 4 % until 1975, productive levels of over 30 million sq.m. and of around 37 million sq.m. would be attained respectively in the years stated.

The market for sheet-metal central-heating radiators in Italy

In 1963, Italian production of cast-iron and sheet-metal central-heating radiators was estimated from the results of direct enquiries to producers and contractors, as 5.7 million sq.m. of radiating surface, of which almost 70 % consisted of cast-iron radiators (3.9 million sq.m.) and the remaining 30 % (1.8 million sq.m.) of sheet-metal radiators (not long ago production of the latter was less than 15 % of the total). Over the preceding five years, total production of radiators (see Table 4.1.8 - XIII) had grown by an average of 5 % per annum with a slightly higher rate of about 7 %—as already stated—for the sheet-metal type.

The figure for production of cast-iron radiators given in the table referred to requires suitable interpretation. As distinct from sheet-metal radiators, it covers a larger number of producers (including many of small dimensions) and reflects the fact that, especially for a few large undertakings, sales include not only radiators completely produced by them, but also radiators obtained by the assembly, completion and finishing of blanks supplied by outside foundries, associated in some cases. Since it was impossible to distinguish these two particular aspects, the production data were obtained from the total sales of the undertakings.

Imports of cast-iron radiators appearing in the foreign trade statistics refer almost exclusively to the aforesaid blanks. In 1963, these imports exceeded 41 000 tons, of which 21 000 tons originated from member countries of the EEC (chiefly France, followed by the Federal Republic of Germany and Belgium-Luxembourg), and the remainder from third countries (United Kingdom, etc.); in terms of assembled radiators, these represented over 1.3 million sq.m., which in practice are included in the production figure indicated in the table. If the fraction originating from imported blanks were excluded from total production, national output of cast-iron radiators in 1963 would be reduced to 2.6 million sq.m. These imports tend to decrease due to the tendency of certain large manufacturers to produce their own blanks; consequently it is anticipated that they will be eliminated before long.

Italian exports of cast-iron radiators were negligible in 1963.

Taking into account the proportion (5 %) to be deducted for breakages during transport, storage and installation, the internal market (net internal demand) absorbed 3.7 million sq.m. of cast-iron radiators in that year.

Production of sheet-metal radiators, although attributable to 12 undertakings all located in the north, was effected practically by 3 larger undertakings in 1963, the production of the 2 largest being of the order of 850 000 and 680 000 sq.m./year respectively.

Imports of this type of radiator were extremely modest; exports were also very small in that year, although with a strong trend towards expansion. Internal demand could therefore be identified with production.

Table 4.1.8 - XIII, which has already been mentioned, contains some estimates for the year 1965. Production of sheet-metal radiators should be 22 % higher than in 1963, due not so much to an increase in internal demand as to the expansion of sales abroad and an increase in stocks. As will be explained later, the increase in stocks shown in the table may be regarded as an under-estimate because the level of internal demand indicated is based rather on "normal" absorption by the building industry, which in fact is currently in difficulties.

The increase in production is mainly attributable to a single undertaking. Between 1964 and 1965, the largest Italian producer of sheet-metal radiators increased his capacity to 1.5 million sq.m., becoming the second largest producer in the EEC; in 1965, the economic situation will presumably keep his output below capacity, and production is expected to be lower that 1.2 million sq.metres. The production potential of the radiator industry in Italy probably amounts today to 2.6 million sq.m./year, and its effective capacity to 2.4 million sq.m./year.

The production of cast-iron radiators in 1965 is estimated at 4 million sq.m., approximately equal to the 1964 figure and slightly more than 2 % higher than that for 1963. In fact, the figure given for 1965 does not indicate any profound change in the productive situation. Stimulated by heavy market demand, extensions and various new projects have been undertaken during recent years, including one in the Naples area for a production of 800 000 sq.m./year. This relates largely to investments in plants for direct production of blanks previously imported. For the purposes of "direct" production, it may be said that during recent years Italian productive potential has virtually doubled. With the completion of certain works still in progress, the potential of the Italian cast-iron radiator industry should reach approximately 5 million sq.m./year (with an effective capacity of over 4.5 million) and the imports discussed above will no longer be required.

Taking the two types of radiators together, the Italian industry probably has a production potential of 7.6 million sq.m./year, approximately equal to 6.9 million in terms of normal effective production.

Going on to study the most important aspects of the distribution of sheet-metal radiators, which are the subject of the present analysis, it must be remembered that the large producers market through the same organization (depots, etc.) as for the cookers, bath tubs etc., which they also manufacture.

The list price on the Italian market is on average 5 800 lire/sq.m. (7 200 lire/sq.m. on average for cast-iron). The price for deliveries to medium and small contractors is around 4 930 lire/sq.m. (6 120 lire/sq.m. for cast-iron); for large supplies to large contractors and to public bodies, the price may be subject to 8 - 10 % reduction.

These prices include packing and transport charges for producers' account. The packing generally consists of a wooden crate for six radiators, each 2.4 sq.m.; the weight of the crate is 1.52 kg. per sq.m. of radiating surface. This costs on average 980 lire, hence the average packing cost per sq.m. radiating surface amounts to 68 lire. The cost of transport by lorry and trailer, for a producer in the industrial triangle, for deliveries to depots in northern Italy, is on average 110 - 130 lire per sq.m., in central Italy 160 - 180 lire per sq.m., and in the Mezzogiorno (mainland), 210 lire per sq.m. ([1]).

Forecasts of demand for radiators on the Italian market are summarized in Table 4.1.8 - XIV. For the reference year 1965, the net total demand for radiators of all types was obtained from percentages of installations in new buildings, obtained from the results of previous studies and from *ad hoc* direct enquiries among builders and central-heating contractors. It has been ascertained that, in that year, among new buildings for residential use in the centre-north, 85 % of new dwellings have central heating in communes of over 20 000 inhabitants and 45 % in communes smaller than 20 000 inhabitants; in the Mezzogiorno, 45 % in communes of over 20 000 inhabitants, and 16 % in others. Other dwellings have various heating systems, and are generally small individual, single-family dwellings which use stoves, etc.; a large number of dwellings, especially in the Mezzogiorno, are without heating.

These percentages have been applied directly to the number of new heatable dwelling rooms (including the bathroom and excluding the kitchen) which—according to the "normal" trends of building growth forecasts worked out for the present study—should be constructed in 1965 in the geographical areas and types of communes stated above. It is certain that the number of buildings which will in fact be constructed in that year of trade depression and crisis in the building industry will be below the anticipated "normal", but it was thought convenient to use these "normal" data for the said forecasts for the demand for radiators in order to avoid over-estimating future increases.

After estimating the number of new rooms with central heating, the number of sq.m. of radiator heating surface required for new dwellings in that year was obtained by applying average coefficients (about 4 sq.m. of radiating surface per room in the north and less than 3 sq.m. in the Mezzogiorno). Allowance was also made in the Mezzogiorno, in communes of over 20 000 inhabitants, for a small proportion of dwellings already existing which would introduce central heating in future. The number of sq.m. of radiating surface required by new non-residential buildings was estimated in the same way.

The "normal" level of internal demand for radiators for 1965 indicated in Table 4.1.8 - XIII is derived from the type of estimate described; the increase in stocks in that year was determined as the difference between the figures for production and foreign trade and those for internal demand. As previously stated, the actual increase in stocks may be greater, but this should be absorbed upon resumption of building activity.

For the purposes of the forecasts, internal demand for sheet-metal radiators in 1965 was broken down in the broadest terms by residential and non-residential uses and by geographical areas. Of the total of this internal demand, 77 % is probably destined for residential uses and 23 % for non-residential buildings; of the same total, 64 % relates to cast-iron radiators and 36 % to sheet-metal types; for the latter, the "normal" level of demand is thought to be 1.4 million sq.m. in the centre-north and 400 000 in the Mezzogiorno.

In forecasting internal demand for central heating radiators, it was assumed that, by 1970, the percentages of new buildings equipped with heating by radi-

([1]) The cost of transport, including sea transport is over 240 lire per sq.m. for Sicily, 470 lire per sq.m. for Sardinia.

ators in the centre-north would reach 90 % for communes of over 20 000 inhabitants, 50 % for communes of under 20 000 inhabitants, and in the Mezzogiorno 60 % and 20 % respectively. From 1970 to 1975, these percentages are unlikely to be subject to important variations, having reached a pattern in which, within certain limits, variations in income and in other factors would have no further influence on the proportion of new dwellings fitted with central heating.

According to these assumptions, the overall demand for radiators would amount to 6.8 million sq.m. in 1970 to 8.7 million sq.m. in 1975, of which 75 % will be for residential uses and 25 % for other buildings.

It was assumed that sheet-metal radiators will constitute 39 % of internal demand in 1970 and 41 % in 1975. This assumption is justified because, as already explained above, during the next few years competition in Italy between the two types of radiators will become more pronounced and the constructors of sheet-metal radiators will take advantage of wider scope and will be able to cut their prices if necessary. Faced with this effective and decisive possibility, the proportion of internal demand absorbed by sheet-metal radiators should really be assumed to be higher, but a cautious approach was preferred on the grounds that demand does not depend exclusively on relative prices, but is conditioned by the attitude of installers who, on the basis of higher value, receive better remuneration for cast-iron radiators.

The results of the forecasts make it clear that, whereas internal demand for all types of radiators is likely to increase during the next five years at an annual rate of 6 %, and in the next period 5 %, demand for sheet-metal radiators will probably grow at rates of 7.6 % and 6 % respectively, reaching 2.7 million sq.m. in 1970 and 3.6 million sq.m. in 1975.

The growth rates for internal demand for sheet-metal radiators in the various geographical areas are shown by way of indication in Table 4.1.8 - XIV already mentioned. In particular, demand is likely to grow more quickly in the Mezzogiorno (non-continuous heating, cheap housing, etc.); the demand for these radiators in that region will probably exceed 650 000 sq.m. in 1970 and 870 000 sq.m. in 1975 (1).

In conclusion, national demand for sheet-metal radiators is likely to increase by over 810 000 sq.m. in the next 5 years and by 920 000 sq.m. in the following period (see Table 4.1.8 - XV). Assuming an increase in exports of only 2 - 3 % annually, and bearing in mind that in 1965 the level of production was partly due to an increase in stocks, Italian production of sheet-metal radiators is likely to increase in the first five years at a slower tempo than internal demand—specifically by 640 000 sq.m.—whilst in the second 5-year period the increase should exceed 940 000 sq.m. The production in question should increase by slightly over 5 % from 1965-1970 and around 6 % in the following period 1970-1975. Allowing for the current productive capacity of this industry, a further increase in capacity of approximately 400 000 sq.m. would be necessary to handle the increase in output of sheet-metal radiators by 1970. On the other hand, in the years before 1970, the cast-iron radiator industry is likely to have capacity in excess of demand, excluding the possibility of increasing sales abroad.

The market for enamelled steel hollow-ware in the EEC

It should be stated at the outset that, at the commencement of the present study, consideration was given to the possibiliy of suggesting a unit for the production of various domestic hollow-ware and tableware in metal (2) as a new project in the pole.

A preliminary study led to the conclusion that aluminium hollow-ware and tableware should be excluded, since both demand and production definitely appear to be in decline. On this subject, it should be observed that, in modern times, aluminium tends to be used only for pressure cookers, for large cookers and for other limited uses, and to be replaced generally by enamelled and steel hollow-ware. Among the reasons for the decline of aluminium there is the disadvantage that it is distorted by electric hotplates, so that utensils become rounded at the bottom and therefore less efficient, and also the fact that, owing to price competition—especially in certain markets—the thickness of this hollow-ware has been reduced, impairing its quality; also, in contact with flame it scales—i.e. it burns. In any case, the competitivity of aluminium hollow-ware has also been decreasing in terms of prices as compared with other types of hollow-ware.

The possibility of producing hollow-ware in black sheet-metal was also excluded, not only because of the limited prospects offered by the relative overall demand for this product, but also, and chiefly, for reasons connected with production techniques. An undertaking which produces enamelled hollow-ware and other enamelled products is not, in principle, in a position to black sheet-metal ware as well due to incompatibility with enamelling: hot chemical blackening or similar processes form gases, the discharge of which would damage the enamelling process.

Market research was therefore directed to enamelled and steel hollow-ware and tableware; but in view of the reduced tempo of expansion in the production of

(1) Excluding Sardinia, the figures would be 600 000 and 800 000 sq.m. respectively.

(2) Domestic tableware is understood here to mean non-hygienic-sanitary ware for domestic and similar uses, also excluding cutlery, and hollow-ware which constitutes a separate heading.

the various types of tableware, it was decided to concentrate the analysis exclusively on hollow-ware of the aforesaid types. It was however found that, in the EEC countries only very fragmentary information and statistical data were available on this subject.

Nevertheless, after a careful appreciation of the available statistics and other information obtained from producers and distributors, it would appear that production of enamelled and steel hollow-ware is only rising slowly in the countries of the EEC, except Italy; sometimes in fact we have a decline or a stationary position. Even the official statistics, notwithstanding their heterogeneity and incompleteness, appear to confirm this direct information. In the Federal Republic of Germany, for example, the production of domestic articles in ferrous or non-ferrous metal, including enamelled, declined from 62 000 tons to about 55 000 tons between 1960 and 1963; in France, the production of enamelled domestic articles declined in the same years from over 8 000 tons to a little more than 6 000 tons. The official statistics for the Benelux countries show that enamelled and steel domestic articles have, by contrast, shown a slightly rising trend.

As will be seen later, the only market offering any appreciable interest for a possible project is Italy, above all in the field of enamelled steel hollow-ware.

For the remaining countries of the EEC, especially for the large German and French markets, it is probable that when the process of settlement still in progress between demand and supply is complete, the tempo of expansion of these products will resume with rates of the order of 2-4 %. In Italy, however, the forecasts for the next 10 years are much more favourable; in particular, for enamelled steel hollow-ware, a growth rate above 10 % is expected.

When considering the possibility of setting up a productive unit in this field in the Mezzogiorno, studies, including a full study of competition at Community level, showed that the largest producers in the EEC have a potential of 2-2.5 thousand tons annually. Existing units with dimensions of this order number 3 in Germany, 2 in Italy and 1 in France. Based on economic and technical criteria, and subject to certain conditions, undertakings which reach an output of one thousand tons per year can be included among large producers, with the same degree of competitivity.

The market for enamelled steel hollow-ware in Italy

In Italy, the average family stock of hollow-ware and tableware is composed chiefly of articles made of aluminium, mainly due to its low price. With the increase in per capita income during the last decade, a tendency to replace aluminium (which has serious disadvantages), chiefly by enamelled and stainless steel products, has emerged, at first on a small scale and then with ever increasing volume.

While the production of aluminium hollow-ware and tableware has dropped, the same products in stainless steel and enamel have shown a certain expansion, although at different tempos, appreciable for the former and very considerable for the latter.

The production of stainless steel hollow-ware and tableware increased between 1963 and 1965 at a rate of 3-4 %, reaching 2.1 thousand tons/year; considering only hollow-ware (virtually all ordinary stainless steel) this rate exceeds 5 % (these rates refer to the following data expressed in tons for 1965: hollow-ware 1 260, tableware 870). On the other hand, production of domestic hollow-ware and tableware in enamelled steel increased over the same period at a rate of 23 %; for hollow-ware alone, representing 86 % of the total, the growth rate was 25 %.

Considering the moderate rate of expansion for the stainless steel products studied, and above all the low absolute level of demand for them—even assuming rapid replacement of aluminium by steel resulting in families more than doubling the quantities owned—increases in demand during the next decade are not such (even allowing for a reasonable increase in exports) as to be capable of absorbing the supply from a new large project in this field. Furthermore, within the general pattern of integrated industries for the pole, which provides for a subsidiary sheet-metal shaping unit, the production of stainless steel hollow-ware would practically be reduced to finishing operations in the main unit. As regards stainless steel tableware, it should be noted that a considerable part of this is not deep-drawn (sugar bowls, teapots, graters, etc.; deep-drawn tableware comprises plates, saucers, ash trays and various serving ware).

Going on to a more detailed study of enamelled steel hollow-ware and tableware, the data for which are shown in Table 4.1.8 - XVI, we see how foreign trade, which up to 1963 was insignificant, since internal supply and demand practically coincided with the overall figures, was intensified in 1965 with an initial strengthening of exports of hollow-ware to EEC countries and to Mediterranean and Middle-Eastern countries, thanks to the quality of the product and to the low prices quoted. These exports are mainly due to one of the largest Italian producers. This increase does not involve enamelled steel tableware which apart from the limiting factors noted for the sheet-metal product, constitutes a poor article destined to be replaced to a large extent by articles made of plastics, other metals, etc.

The present study was finally concentrated entirely on enamelled steel hollow-ware.

An analysis of the structure of demand for enamelled steel hollow-ware alone in 1965 appears in Table 4.1.8 - XVII. Of an overall demand of 6 115 tons, almost 97 % was internal, and little more than 3 % external. Of the total internal demand (5 915 t) less than 40 % were additions to the total stock, and over 60 % was replacement demand, calculated on

the basis of a total estimated stock of over 24 thousand tons of enamel ware in households, communal dwellings and public services. It is important to note that the figure for total stocks includes not only enamelled steel hollow-ware (which actually constitutes the major part of Italian production in this field) but also the black enamelled sheet-metal product, for which demand and production are running down (enamelled hollow-ware in black sheet-metal is now produced in limited quantities by small craft undertakings; although lower in price, its poor quality prevents it from competing with enamelled steel hollow-ware) ([1]).

The estimate of the total national stock of enamelled hollow-ware was obtained by multiplying the number of households in 1965 by the average current stock per household for these types of hollow-ware. According to information obtained from various sources, this average stock appears to vary substantially according to region and to the distribution of the population in communes with more or less than 20 000 inhabitants: the range is from maxima of 2.5 kg. to minima of 0.6 kg. per household in the smallest communes in the Mezzogiorno. This substantial variation is not due only to the different number of utensils forming the family stock but also to the fact that modern enamelled steel vessels have almost double the weight of enamelled black sheet-metal ones, and that the former predominate in households in regions with a higher standard of living, whilst the latter predominate in those with a lower per capita income. The estimate of stocks of such hollow-ware in communal dwellings and public services was made in a similar way on the basis of their numbers and estimated average stock.

From the data obtained and given in this table it is clear that over 90 % of internal demand originates from households, and the remainder (under 10 %) from communal dwellings and public services. Almost 4/5 of the demand from households is located in the centre-north, and the remaining fifth in the Mezzogiorno.

As already stated, with imports at a negligible level, the overall supply is virtually identical with internal supply. When the analysis of the internal supply of enamelled steel hollow-ware is carried further, we find that in 1965 almost 2/3 of production was concentrated in the two largest undertakings, located in the north (one with an output reaching 2.5 thousand tons, and the second 2.2 thousand tons, but including a small proportion of other tableware), 1/5 is from various medium-sized undertakings, each with an output well below 1 000 t/year, and the remaining 14 % from numerous other smaller producers. It should be noted that the combined production of enamelled domestic tableware was distributed among the medium-small producers, and that there still exists, almost wholly at craft level, a tiny production of enamelled black sheet-metal hollow-ware which is obtained by working on the "lathe" and not by deep-drawing (the latter on the other hand calls for investments in plant and equipment which are possible only on an industrial scale.).

It is reported that projects for considerable increases in production, all to be executed in north Italy, are being studied by some of the larger Italian producers.

With regard to the methods of distribution adopted by the largest producers, it is possible to say that the marketing system is based on a network of depots in the principal urban centres, staffed by their own personnel who in turn distribute to retailers. Prices charged to retailers, inclusive of packing and transport charges, amount to around 1 600 lire for a medium sized utensil in enamelled steel; the corresponding list price is approximately 2 000 lire/kg. The cost of transport by lorry for the hollow-ware in question, from a locality in the industrial triangle to the centre-north, is around 8 - 12 lire/kg compared with 18 lire for the Mezzogiorno mainland ([2]). The amount of packing costs, generally in crates with boxes and cartons, is approximately 10 - 11 lire/kg.

In working out the forecasts of internal demand for enamelled steel hollow-ware in 1970 and 1975, allowance had of course to be made for changes in an average family's stock of aluminium hollow-ware from the base year 1965, and its expected progressive replacement by enamelled steel and stainless steel hollow-ware. In particular, it was assumed, that, by 1965, the stock of aluminium hollow-ware ([3]) in the centre-north, would be down to 1/3 of the current holding in communes above 20 000 inhabitants and to 40 % in communes below 20 000 inhabitants; in the Mezzogiorno, for the population resident in the two classes of communes, the stock would probably be respectively 40 % and 55 % of the base figure. It is highly probable that by 1975 aluminium hollow-ware will in fact have almost totally disappeared, chiefly for reasons of supply.

Assuming that the stock of hollow-ware of all types in an average family remains almost constant during the next 10 years in terms of capacity (rather than assuming a limited reduction in this capacity due to known decreasing trends in the average size of the average family), the proportion of (aluminium) hollow-ware which will be replaced on renewal by enamelled steel and stainless steel hollow-ware will increase in terms of weight. In fact, these last two

([1]) Enamelled cast-iron hollow-ware is also disappearing from the market due to its excessive weight, high price, etc.

([2]) The average cost of transport plus packing is around 20 lire per kg. for Sicily and about 30 lire for Sardinia.

([3]) Based on information acquired from various sources, the current stock of aluminium hollow-ware per average family, is believed to vary, by regions, from about 3.5 kg. in the north to under 3 kg. in the Mezzogiorno in communes smaller than 20 000 inhabitants.

types of hollow-ware have almost twice the weight of the first, for equal capacity. It was further assumed that, of the amount of hollow-ware renewed, approximately 75 - 80 % would be replaced by enamelled steel, and the remainder by stainless steel.

It is difficult to determine this proportion, since consumer preferences in the matter of this choice are influenced by many factors. It is however a fact that recent trends in demand, which have been reflected in production, seem to indicate a proportion of 1:4 and higher between stainless steel and enamelled steel. It is also important to bear in mind that, towards 1970, enamelled steel hollow-ware will probably have a lower selling price than second-class stainless steel ([1]). It is therefore to be expected, as a result of increasing competition, that there will be a reduction in prices for enamelled steel hollow-ware, at least during the second half of the next decade.

It must be emphasized that, although enamelled steel hollow-ware encountered initial difficulties and some hesitation on the part of customers due to various drawbacks in use, these have now been duly overcome, and its acceptance on the Italian market is now indisputable. From the technological standpoint, up to about a decade ago, difficulties were experienced with the enamel which did not stand up to food acids or to flame (up to that period enamelled hollow-ware was guaranteed only for use on electric plates). Subsequently, thanks to new American techniques, an anti-acid enamel which resists even the most corrosive acids has been introduced into the manufacture of this hollow-ware; another technical problem which has been overcome was that of reprocessing the enamelling. New production techniques have eliminated the disadvantage of sharp surfaces, which at one time used to form on the utensils during the drying process after they had been dipped in the enamel; the elimination of sharp edges was achieved by perfected equipment and by shrinking a stainless steel ring onto the edge.

In view of what has been said, the average stock of enamelled hollow-ware per family is expected by 1975 to reach maxima ranging from 6 kg to about 2 kg according to regions and classes of communes, (whereas stainless steel will probably reach maxima from around 2 kg to about 0.6 kg). These stocks have been applied to the number of families in the years covered by the forecast. The corresponding demand is the difference between the stock in a given year and that in the previous one; the replacement demand was obtained on the basis of an average life of 5 - 6 years in the first 5-year period and 6 - 7 years in the next one, reflecting an improvement in the quality in this type of hollow-ware. For the forecasts of internal demand originating from communal dwellings and public services, forecasts of increase in the population and in the corresponding activities were considered as well as replacement percentages.

The results of the forecasts for 1970 and for 1975 are shown in Table 4.1.8 - XVII. Internal demand will reach 11 000 tons in 5 years and 19 000 tons at the end of the ten years, achieving growth rates in that period of 11 - 13 % (against 20 % over the last few years). The consequent increase would be over 5 000 tons in the first 5-year period and almost 8 000 tons in the second. In particular, demand in the Mezzogiorno should reach over 2.6 thousand tons in 1970 and almost 5.3 thousand tons in 1975; the corresponding increases are expected to be 1.4 thousand tons in the first 5 years and 2.6 thousand tons in the next. It is interesting to observe that, whereas sales in the Mezzogiorno at present account for approximately 20 % of the total, in 1975 their weight will be nearly 30 %. This expected greater increase in demand is explained by the fact that in these regions, apart from the substitution factors described above, there is greater elasticity in demand, with respect to both incomes and relative prices, due to an increase in per capita incomes from lower initial levels.

Although there are interesting prospects for exports, especially to the Mediterranean basin and to the Middle-East, as well as to the eastern countries, the forecasts in the table mentioned allow only for a slight increase on the current modest level of sales abroad, which in 1975 will probably represent less than 2 % of production, which will virtually reach the levels and growth rates indicated above for internal demand.

Even adopting "low" assumptions, which allow for replacement of aluminium by enamelled steel to a smaller extent, or at a slower rate, or assuming much lower stocks per family—affecting the size of the increases in internal demand and in production—it is reasonable to suppose that these increases will contract at most by one half (this would still be equivalent to a possible increase of over 2.5 thousand tons in the productive capacity of the industry studied at the end of the period 1965-70 and of over 3.5 thousand tons in the period up to 1975).

Market on which the new unit can rely, and its dimensions

In normal circumstances, the unit will produce over 12 000 tons annually of cookers, sheet-metal bath tubs and radiators, and enamelled steel hollow-ware.

([1]) The production cost of first-class stainless steel hollow-ware is relatively high. Since stainless steel is not a good conductor of heat, the best hollow-ware in this material has a copper support inserted between the base of the utensil and the outer layer which is in contact with the source of radiation; the purpose of this is to increase efficiency. The production of these "sandwich" utensils is very expensive, because it calls for special machines for welding etc. Due to its sale price, it is a luxury article on the Italian market (approx. 6 000 lire-kg.) and accounts for less than 10 % of production of stainless steel hollow-ware.

The pattern and distribution of the normal level of production may be on the following lines:

	Internal Market			Export	Total Production	
	Total	Centre North	Mezzo-giorno		in original units	in tons
Cookers (number)	50 000	10 000	40 000	25 000	75 000	4 736
Sheet-metal bath tubs (number)	90 000	50 000	40 000	10 000	100 000	4 400
Sheet-metal radiators (sq. m.)	180 000	80 000	100 000	20 000	200 000	2 500
Enamelled hollow-ware (t)	1 000	250	750	—	1 000	1 000
	—	—	—	—	—	12 636

On the basis of the results of the present analysis of demand and supply, levels of sales will now be assessed with reference to the national and international market, and with reference to the individual lines produced by the unit.

Cookers

Production of cookers would comprise from 50 - 100 models, depending on the different requirements of customers on the home market and the larger export markets. These models would not differ much among themselves, and could be reduced to 10 - 15 basic models, in which standard elements and sub-assemblies would still predominate.

Given the particular productive and commercial features of the new unit, which with an annual production of 100 000 cookers would be among the first 5 largest Italian producers, and taking account of its competitivity, one may assume that 1/3 of its production can be exported. This quantity would represent 7 % of Italian exports of cookers in 1970.

Production by the projected unit for the internal market would satisfy 3.5 % of national demand in 1970, and less than 15 % of the increase in such demand between 1969 and 1971.

The distribution of production for the internal market (50 000 units/year) between the Mezzogiorno (40 000 or 80 %) and centre-north (10 000 or 20 %) satisfies the general criterion that the regional pattern of sales in Italy, in terms of distance from the undertaking to the consumer centres, should be similar to that of competitors in the north (currently 70 % to the centre-north and 30 % to the Mezzogiorno). In this context, appreciable regional differences may be noted in the incidence of transport costs met by the producer (currently, for units of the industrial triangle, the cost of transport to depots in the centre-north averages 1 % of the wholesale price to retailers and 3 % for depots in the Mezzogiorno).

Expected sales to the centre-north by the unit under consideration would represent slightly more than 1 % of the corresponding internal demand in 1970 and only 6 % of the increase in demand in the centre-north in the period 1969-71. Its sales to the Mezzogiorno would constitute 8 % of internal demand of the regions involved in 1970, and less than 1/4 of the increase in this demand in the years 1969-71.

Sheet-metal bath tubs

The unit would produce 100 000 bath tubs annually, of a single model of the normal type (models on the market can be reduced to 5 - 6, including baths with seat). This production would place the unit on a par with the two largest Italian producers.

10 % of its production would be exported, especially to countries of the Mediterranean basin and Middle-East. According to the figures indicated in the forecasts these sales abroad would represent 1/3 of Italian exports of sheet-metal bath tubs in 1970 and 1/6 in 1975. These figures are based on conservative criteria inasmuch as they also depend on individual variations in the commercial policy of the largest firms, which are difficult to determine.

The predominant part of the unit's output (90 000 baths) would be destined for national demand, covering less than 1/5 in 1970, and about 2/3 of the increment in the 3 years 1969-71.

Sales to the Italian market would be distributed 45 % to the Mezzogiorno (40 000 baths) and 55 % to the centre-north (50 000 baths), particularly in central Italy. This pattern would tend to approximate the regional distribution of the projected unit's sales, in terms of distance, to the conditions prevailing for the large competing undertakings located in the north, whose sales are distributed approximately 2/3 to the regions of the centre-north and 1/3 to those of the Mezzogiorno (producers' transport costs from the industrial triangle currently average 2.8 % on the wholesale price to retailers and large contractors for

deliveries and depots in the north, 3.8 % for central Italy and 4.8 % for the mainland Mezzogiorno).

The proportion of sales forecast for the centre-north for the unit studied would represent 18 % of the corresponding demand in 1970, and approximately half the increase in demand in those regions in the 3-year period mentioned above. Sales to the Mezzogiorno would constitute 1/4 of demand in 1970, and should absorb a large part of the increase likely to take place in the south between 1969 and 71.

Sheet-metal central-heating radiators

The unit studied would produce 200 000 sq.m. of sheet-metal central-heating radiators annually. This output would put the undertaking in fourth place among the large Italian producers in the sector.

The unit would produce 90 % for the internal market (180 000 sq.m.) and the remaining 10 % (20 000 sq.m.) for abroad. The increases in exports allowed for in the forecasts on an earlier page mainly reflect those of the unit studied. Here, as in the case of sheet-metal bath tubs, production in Italy is concentrated in a small number of large undertakings; as a result, it is difficult—within the reasonable limits of the export possibilities in this field—to determine their effective future level, which as already stated also depends upon changes in the commercial policy of the larger undertakings.

Sales at home should cover approximately 7 % of the national demand in 1970 and 1/3 of its increase in the years 1969-71.

The unit's sales to the national market would be distributed 56 % to the Mezzogiorno (100 000 sq.m.) and 44 % (80 000 sq.m.) to the centre-north, particularly the central regions. This regional breakdown of the unit's sales would also tend to reproduce, in terms of distance, the prevailing distributing conditions of the large producers located in the north, whose sales are distributed 3/4 to the centre-north and 1/4 to the Mezzogiorno (transport costs paid by producers located in the industrial triangle average 2.6 % of the price charged to medium-small contractors for deliveries to depots in the north, 3.6 % to depots in central Italy, and 4.3 % to the mainland Mezzogiorno).

The projected unit's sales to the centre-north would represent about 4 % of demand in 1970 and 14 % of the increase in those regions over the period 1969-71. Sales to the Mezzogiorno would constitute 15 % of the relative demand in 1970 and might absorb 3/4 of the increase in demand experienced in the south during the 3-year period 1969-71.

Enamelled steel hollow-ware

The unit would have an annual output of 1 000 tons of enamelled steel hollow-ware in various shapes and colours which, in terms of productive levels, would place it among the three largest Italian producers of this type of hollow-ware.

Although good export prospects exist, it may be considered that the entire production of the unit could be completely and conveniently sold on the internal market.

Taking into account the low incidence of producers' transport costs on the wholesale price to depots, and the consequent minor significance of regional differences, it is not very important, at least from this aspect, to predetermine the distribution of sales between north and south (for large producers of the industrial triangle, the average incidence is 0.5 % for sales to the centre-north and 0.8 % for the mainland Mezzogiorno, with 75 % of sales going to the former group of regions and 25 % to the latter).

Nevertheless, as a guide, one may assume that the sales of the unit in question may be divided 70 % (700 tons) to the Mezzogiorno and 30 % (300 tons) to the centre-north. This would represent, less than 1/4 of the corresponding demand in the Mezzogiorno in 1970 and approximately 60 % of its increase in the years 1969-71. As regards the centre-north, the unit's sales would represent 3 % of the demand originating in these regions in 1970 and 10 % of the increase over the 3-year period considered.

Unit III

MANUFACTURE OF CENTRIFUGAL PUMPS AND OIL BURNERS

The market for centrifugal pumps in the EEC

Piston pumps are now going out of use and are being replaced by rotary pumps, and above all by centrifugal pumps. In view of these tendencies, and of the fact that the production of other types of pumps is concerned mainly with special types which require special labour and subsidiary units, not planned for the pole and/or mainly non-series productions, the analysis of the market for the purposes of the present study has been restricted to that for centrifugal pumps (1).

The data used in the analysis were conditioned by frequent difficulty in resolving problems arising from the lack of comparability between the statistics of the various countries, or from the lack of specific information. The production statistics of some member countries give the data for pumps by number or weight only, others by value only, and do not distinguish centrifugal pumps from other pumps for liquids. Some sources do not specify whether the

(1) The following electropumps constitute centrifugal pumps (or may also be such): electropumps proper, single-rotors, verticals, self-priming with vertical axis, self-priming with horizontal axis, self-priming rotaries, pumps for heating plants, with opposed rotors, accelerators and circulators for heating plants, etc.

reported data relate to the complete power unit, or only to the mechanical unit excluding the electrical switchgear etc.

The statistics are also silent on such essential points as pump head and capacity. By means of estimates and adjustments, it has only been possible to work out Community statistics in terms of weight, although it must be acknowledged that, for equal total and unit weights, there can be substantial differences of head and/or capacity. The data reported below are therefore useful only for very broad assessments.

The data summarized in Table 4.1.8 - XVIII confirm that the market for centrifugal pumps has grown substantially. In the period 1959-63, the EEC market expanded at an annual rate of approximately 13 %. In particular, internal demand grew by almost 14 % per annum, from 40 000 tons to about 66 000 tons in 1963. This development of demand inside the Community is much greater, in general, than that of the "normal" demand for pumps from user sectors, and this growth rate reflects the replacement of other types by centrifugal pumps to which reference has already been made. Demand for and production of centrifugal pumps in fact grew from little more than 1/3 of the total in 1959 to around 2/3 in 1963.

Starting from 46 000 tons, production had exceeded 73 000 tons by the end of that period, showing a growth rate of 12 %, slightly lower than that of the internal demand. It follows that, although exports subsequently increased over the period at a rate of 11 %, imports increased at a rate of 22 % in order to maintain the balance between demand and supply. It must however be remembered that in 1963 EEC exports were of the order of 13 000 tons against under 6 000 tons of imports coming mainly from the USA, the United Kingdom and some EFTA countries.

Whilst the EEC's trade with the rest of the world increased at an annual rate of approximately 14 %, over the period inter-community trade doubled, with an annual growth rate of 28 %. On trade within the EEC, the Federal Republic of Germany was a substantial net exporter, whilst all the other countries, except Belgium where imports and exports virtually balanced, were net importers.

Inside the Community, the market for centrifugal pumps expanded at rather different rates in the various member countries. The increase in internal demand was around the EEC average in Germany, slightly below in France and Italy (rates of about 12 %); considerably higher in the Netherlands (over 20 %) and lower in Belgium (about 5 %). In the Netherlands, the high growth rate of internal demand was influenced by agricultural and hydraulic works programmes in addition to other factors.

As regards member countries' production in 1963, Germany contributed over 45 % to Community production with 34 000 tons, and a growth rate of 13 % from 1959 to 1963. The second EEC producer is France with a production exceeding 21 000 tons (30 % of the EEC) and a growth rate of 10 %. Italy followed with a production of over 12 000 tons, and Benelux with 5 500 tons, and growth rates of the order of 13 %.

Taking into account the expected increase in demand for centrifugal pumps for agriculture, residential and non-residential building (for circulating water in heating plants, etc.) aqueducts, industrial plants (chemicals, petrochemicals, engineering, foodstuffs, paper, etc.) and from industries which use centrifugal pumps as inputs for their products (machine tools, burners etc.), it is assumed that internal demand in the EEC may subsequently increase at a rate of 8 % over the next five years and 5 % in the following period. These growth rates, at first halved and then considerably reduced as compared with those recorded before 1963, are based on the realistic view that the replacement process which accelerated the specific demand for centrifugal pumps beyond the normal is approaching exhaustion.

On these growth assumptions, internal demand in the Community is expected to reach 112 000 tons in 1970 and about 144 000 tons in 1975; this would represent an increase of 36 000 tons on the current levels of demand (referred to 1965) over the next 5 years and of 32 000 tons in the following period.

It is interesting to note, in view of the proposal for a new plant in the Mezzogiorno to serve the internal and international markets, that there are about ten larger firms making centrifugal pumps in the EEC, with outputs (limited to this class of pump) exceeding or equalling that of the largest Italian producer (4 - 5 000 t/year). The biggest undertaking in the Community is located in the Federal Republic of Germany; it has a very much higher output and there are several others having a production of the order indicated. A few undertakings of these dimensions also exist in France, one in Belgium and one in the Netherlands, but the latter is relatively small. Still with reference to the construction of centrifugal pumps only, there are various undertakings in the EEC producing around 2 000 t/year. From technical-economic studies made, it has been found that this is the minimum size which economically justifies the use of specific machinery and equipped assembly lines which can work at full capacity. Such undertakings should remain competitive even in the face of the largest producers.

It follows that, allowing for competition from within the EEC and from producers in third countries (USA United Kingdom, Switzerland, Sweden, etc.), the project for the pole should aim at a capacity of 2 - 3 000 t/year and above, provided this is permitted by demand factors and other conditions.

The market for centrifugal pumps in Italy

As already mentioned whilst examining the market for centrifugal pumps in the Community as a whole, the

internal demand for these products in Italy increased during the period studied at an annual rate of approximately 12 %, slightly below the average rate for the EEC, and exceeded 12 000 tons in 1963 (numerically about 430 000). The overall demand in that year touched 16 000 tons, if we include a further 3 000 tons of pumps exported, largely outside the EEC, to countries in the Mediterranean basin, the Middle East and eastern Europe.

The corresponding supply in 1963 was constituted by production roughly equivalent in weight to the level of internal demand (numerically, 444 000) (1) and by imports slightly exceeding exports in volume. It should be noted that whereas the latter were chiefly medium-small centrifugal pumps, the former were heavier types with special characteristics.

Of the internal demand in that year, in terms of weight, over 1/5 originated from agriculture, 2/5 from building, 1/5 from industrial plants (2), and the remainder from industries which use such pumps as inputs for their products, water conduits and other uses (see Table 4.1.8 - XX) (3).

In particular, the demand for centrifugal pumps for agriculture was a "new" demand (by increase of total numbers) of about 860 tons (410 t centre-north, 450 t Mezzogiorno) and to a replacement demand of 2 000 t (1 420 t centre-north; 580 t Mezzogiorno); totalling 2 860 t. (1 830 t centre-north, 1 030 t Mezzogiorno) (4).

(1) Italian production of centrifugal pumps accounted for over 90 % of the total number of pumps for liquids.
(2) Except iron and steel plants included under "Other uses".
(3) The breakdown of internal demand by consumer sectors is obtained from the results of an *ad hoc* enquiry for the present study carried out by Italconsult with the co-operation of producers and distributors of centrifugal pumps, building constructors, and as regards agriculture, aqueducts etc., with the collaboration of experts from the Ministry of Agriculture, of the Cassa for the Mezzogiorno, and of the Rain-water Irrigation Association.
(4) The "new" demand for new plants in 1963 includes the new lands irrigated during the course of the year, and specifically:

	"New pumps"				
	Fresh ha. irrigated	ha. served by 1 pump	Number	Mean weight kg	Mean weight t
Rain water irrigation	45 000	4.3	10 500	60	630
Other irrigation systems	15 000	12.3	1 200	30	36
Horticulture and gardening	10 000	2.2	4 550	15	68

The proportion for the Mezzogiorno was around 50 % for rain water irrigation and other irrigation systems, and of the order of 60 % for horticulture and gardening.

Residential building had absorbed about 3 200 t (107 000 pumps) for water circulation in heating plants (accelerator and distributor). Of the total indicated, 2 766 t were "new" demand (2 274 t centre-north, 492 t Mezzogiorno) and 438 t replacement demand (348 t centre-north, 90 t Mezzogiorno). Other non-residential buildings had absorbed 1 390 t (35 000 pumps) for the same use, of which the "new" demand was 1 176 t (1 032 t centre-north, 144 t Mezzogiorno) and the replacement demand 200 t and 16 t respectively. In urban buildings, for

As for the new demand for pumps for other agricultural uses, the Mezzogiorno takes 67 % for rural wells. But for pumps for raising liquids, the proportion for the Mezzogiorno is around 20 %, since they are less used in this zone than in the remainder of Italy. For land reclamation, the proportion used in the Mezzogiorno is 75 %.

Summarizing for the whole of Italy, we have:

	"New pumps"		
	Number	Mean weight kg	Mean weight t
Rural wells	1 500	10	15
Raising liquids	1 000	30	30
Land reclamation	400	200	80

Of the total replacement demand for agricultural pumps in 1963 the Mezzogiorno accounted for 5 % for rain water irrigation, since the pumps in use are relatively new, 40 % for other types of irrigation, 60 % for horticulture (and gardening) as being traditional in these regions and 65 % for rural wells, since the existing pumps in the Mezzogiorno have an average age higher than the national figure; the Mezzogiorno accounted for 5 % for reclamation works, because although many such schemes relate to the area, almost all have been carried out in the last ten years.
Replacement demand is based, apart from a historical demand series and an estimate of total numbers, on an average life of 6-7 years for rain water irrigation pumps and other types of irrigation, of 5-6 years for horticulture and gardening and for rural wells and of 5 years for raising liquids. These lives refer to the best conditions of use and maintenance, which in reality do not apply; the effective average life must therefore be regarded as shorter than just stated. The average life of pumps in land reclamations is considered to be 7-10 years. The total stock of centrifugal pumps in agriculture in 1963 was composed as follows:

	Total Italy		of which Mezzogiorno	
	in '000	t	in '000	t
Rain water irrigation	115.9	6 954	12.8	767
Other types of irrigation	211.4	6 343	42.6	1 279
Horticulture and gardening	211.8	3 176	115.4	1 731
Rural wells	31.6	316	20.0	200
Raising liquids	29.7	892	11.7	352
Land reclamation	1.7	334	1.0	200
Total	602.1	18 015	203.5	4 529

raising drinking water, in zones served by water supply at insufficient pressure, about 520 t (less than 21 000 pumps) were required, of which almost 380 t were replacement and a total of about 320 t related to the Mezzogiorno. For aqueducts the corresponding demand was of the order of 850 t, made up of 780 t of "new" demand (360 t centre-north, 420 t Mezzogiorno) and 65 t replacement (of which 36 t Mezzogiorno) ([1]).

Demand for centrifugal pumps installed in industrial plant (general and specific; not in machine tools considered earlier) amounted to 2 180 t (around 27 000 pumps); "new" demand was 1 480 t (of which 750 t in the Mezzogiorno, confirming the substantial new investments in chemicals, petrochemicals, etc. in these regions) and replacement demand 700 t (151 t Mezzogiorno, a modest proportion which reflects the scarcity of earlier investments) ([2]).

([1]) The "new" demand for heating plants in residential buildings corresponds to around two pumps for each plant installed in the year in question (data by geographical distribution). A similar correspondence exists for uses in non-residential buildings. The "new" demand for pumps for raising drinking water is related to new buildings, allowing for an estimated percentage located in zones with water supply at insufficient pressure, with over 60 % in the Mezzogiorno and around 40 % in the centre-north. The "new" demand for aqueducts refers to new works executed in the year.

Replacement demand is again based on these uses for pumps, on the average life by types and sectors of use, as well as demand statistics and on the total number of pumps in use. The average life of centrifugal pumps for heating systems is considered to be 7-10 years, for raising drinking water 4-5 years, for aqueducts 10-20 years according to types etc., assuming normal conditions of use and maintenance for all. As regards the number of centrifugal pumps in the sectors studied in 1963, the principal data are given below:

	Mean weight	Total Italy		of which Mezzogiorno	
	in kg	in '000	t	in '000	t
For heating systems in residential buildings	30	410.0	12 300	72.2	2 166
For heating systems in non-residential buildings	40	68.0	5 440	12.2	976
For raising drinking water in urban buildings	25	81.9	2 048	150.0	1 250
For aqueducts	650	15.0	9 750	4.5	2 925
Total		574.9	29 538	238.9	7 317

([2]) In detail, "new" demand for centrifugal pumps in general and specific plants in petrochemicals in the year studied amounted to 450 t (277 t centre-north, 173 t Mezzogiorno) while replacements accounted for 180 t (of which around 60 t Mezzogiorno); for chemical plants "new" demand was 850 t (of which 510 t Mezzogiorno) and 350 t were required for replacement (50 t Mezzogiorno). For plant in the mechanical engineering sector, "new" demand was 140 t (of which only 35 t relating to Mezzogiorno) and replacement demand 90 t (18 t Mezzogiorno). Lastly, for plants in the foodstuffs, paper making industries etc., "new" demand was limited to 40 t (of which 12 t Mezzogiorno) whereas replacement demand amounted to 80 t (of which 24 t Mezzogiorno). It is important to observe that the "new" demand for centrifugal pumps for the said plant relates to installation in respect of all investments (heavy investments), whereas the replacement demand for pumps is limited to substitution requirements occurring on average once during the average life of the plant, which is from 10-20 years according to type. A broad estimate of centrifugal pumps installed in plant in 1964 is as follows:

	Mean weight	Total Italy		of which Mezzogiorno	
	kg	in '000	t	in '000	t
In petrochemical and refinery plants	150	20.0	3 000	5.7	850
In chemical plants	114	50.0	5 900	3.8	430
In mechanical engineering plants	20	70.0	1 400	7.6	153
In plants of various industries (paper making foodstuffs, etc.)	120	8.0	950	1.8	190
Total		148.0	11 250	18.9	1 623

Lastly it must be understood that, in this study, owing to the difficulty of obtaining data, the demand for plant in the iron and steel sector was considered globally under the heading "other uses" (see below).

The production of machine tools, industrial burners and other products which use centrifugal pumps as inputs, required around 820 t (over 116 000 pumps), of which only 28 t were in the Mezzogiorno, owing to the small output of such products in the area ([3]).

Lastly, the internal demand for centrifugal pumps under the general heading "Other uses" is of the order of around 600 t (of which 164 t in the Mezzo-

([3]) It must first of all be clarified that these figures do not include centrifugal pumps "incorporated" in industrial products, but only those which are standard commercial products fitted to the mechanical units of the products in question. For example, in the case of burners, we have excluded the pumps which generally form a structural mechanical part of small burners (but the forecast trends allow for the extension to small burners of standard pump sets produced by specialized intermediate industries). Centrifugal pumps incorporated mechanically in domestic washing machines, etc. are similarly excluded. Strictly these figures should also include centrifugal pumps installed in shipbuilding (ship's plant) which, for lack of adequate information, have not been specifically included, but considered under the general heading "Other uses" (see below). With specific reference to the uses studied, for pumps used in construction of machine tools (over 500 t) the quantity included reflects the statistics of machine tool construction. The figure for burners (over 270 t) is based on the production considered in this section. Since, at least for the products considered, the average life of pumps is generally about equal to that of the products in which they are used, the whole demand for pumps in question must be considered "new".

giorno); as already stated this includes pumps for iron and steel plants, ship's plants etc. It is estimated that slightly more than half of this demand can be considered "new" and the remainder as replacement.

To summarize, out of total internal demand, in 1963, over 2/3 represented "new" demand from consumer sectors and 1/3 replacement demand. From the regional standpoint, 71 % of the internal demand came from the centre-north and the remaining 29 % from the Mezzogiorno.

Bringing up to date the direct enquiries made of producers in 1963, it is estimated that in 1965 Italian production should be of the order of 15 000 t. Estimating imports at less than 2 000 t, and exports at over 3 000 t, internal demand should currently exceed 13 000 t (see Table 4.1.8 - XIX). From these figures, it may be concluded that internal demand has increased only at a rate of around 3 % in the last two years. However, a drastic substitution of imports (cut to around half the 1963 figure) has permitted a further increase in production at a rate of 10 %, only slightly below that for previous years. Whilst the production trend may thus be considered satisfactory, the slower tempo of internal demand reflects the depressed economic situation which has characterized the last two years.

Coming to consider the structure of current supplies, the largest Italian producer of centrifugal pumps, located in the north, as already stated, produces 4 - 5 000 t, equal to more than 1/3 of national production. But it must be recorded that he works only one daily shift, and that his potential is therefore sufficient to increase production to 7 - 8 000 t/year. Two other undertakings with smaller outputs follow, and except for one medium-small unit with standardized production, the remainder of supplies come from over 150 undertakings making small quantities together with other engineering products: a few of them are in the Mezzogiorno. Only one unit of any size operates in the south, making special pumps for the extraction of oil, etc. There is no news of interesting projects in the sector.

It is important to point out that, in terms of weight, more than 60 % of national production of pumps refers to "series" types, and the remainder to "non-series" pumps (numerically, 80 % and 20 % respectively) (1).

The production of "non-series" centrifugal pumps comes chiefly from the large and medium sized units, since this requires adequate machinery and other conditions which the small undertakings are unable to meet. The majority of the large undertakings combine production of such pumps with "series" types, taking advantage of the volume of production which the corresponding lines can handle. On the other hand, many small undertakings "reproduce" or construct to order of a customer who supplies project and drawings; their production can obviously attain only medium or small series levels.

The small producers are not generally highly competitive; on the other hand, not all the large undertakings appear to have production resources economically adequate for "series" production.

A new project with an output of the order of 2 - 3 000 t, with modern equipment, should therefore be able to compete at national level with the few existing large undertakings as regards "non-series" centrifugal pumps; for "series" types, its establishment on the market would be assisted by the situation just described. But it must be remembered that the largest Italian producer of centrifugal pumps also makes electric motors which places him in principle in a favoured situation; but in view of the strong competition which exists in the field of electric motors in Italy, it is possible in practice, on large orders to obtain motors at prices which have much the same incidence on the total cost of making centrifugal pumps as in the case of a producer who makes both the pump and the electric motor.

Sales by the larger producers on the internal market are effected through branches, to consumer industries and to the usual retailers. A large firm requires around ten branches in order to satisfy distribution needs on the Italian market.

The list price of a centrifugal electropump, head 35 m, capacity 63 l/minute, 1.7 HP motor—which can be considered as a representative type of "series" pump—is 56 000 lire at the retailers. The ex-works (or branch) price for large orders shows a discount up to 35 %, and is around 36 - 37 000 lire. For medium orders, this discount is 20 % and the price therefore comes to 45 000 lire. The export price, fob outside the EEC area can be put at about 32 - 33 000 lire taking into account premiums and IGE refunds.

The cost of the packing for pumps of the type indicated, consisting of a box of corrugated board, is on average 300 lire per pump; for export overseas, it consists of the normal cardboard packing plus a wooden crate, and is around 1 300 lire.

The cost of transport (which like the packing cost is for producer's account), by lorry for deliveries from an undertaking in the industrial triangle to the mainland south, is on average 500 lire per pump of this type and 300 lire for deliveries in the centre-north. The incidence of transport and packing costs on the price for large orders is thus on average not above 2 % on the internal market. For exports overseas, the cost of transport to loading port, free on board, from an undertaking in the Milan area amounts to 300 - 400 lire; for a unit located at a port this cost is reduced to approximately half.

(1) "Non-series" pumps in the sense that they are produced for specific orders in limited quantities; again in this case, they are generally standardized except for certain functional adjustments to the particular uses for which these pumps are intended.

The forecasts of internal demand in 1970 and in 1975, based on 1965, have been broken down by user sectors and regional location of the demand (centre-north and Mezzogiorno).

For the demand from agriculture, building and aqueducts, the forecasts include the annual estimates of "new" demand understood as an increase in the number of installed centrifugal pumps, and of "replacement" demand estimated on the basis of retrospective statistics for demand in the sector considered in previous years; allowance is also made for the average life of the type of pumps used in the sector. This method was adopted without knowing the age of existing pumps, of which only the number and weight have been determined (1).

In particular, the "new" demand for centrifugal pumps for agriculture is based on information obtained from the Ministry of Agriculture, from the Cassa per il Mezzogiorno, and from other previously named sources, on the expected ten-year development of rain water irrigaton, other types of irrigation, horticulture and gardening, of the increase in the use of rural wells, of the raising of liquids and of programmed land reclamations. With no change in the parameters stipulated for the analysis and determination of demand and numbers in use in 1963 (see previous text and notes) the number of centrifugal pumps in the agricultural sector should increase by about 4 % per annum from 1965 to 1970 and 3.5 % from 1970 to 1975. This means anticipating, as a basis for planning and programmes, a roughly constant level of "new" demand both for the centre-north (400 t/year) and for the Mezzogiorno (500 t/year) for the whole decade. Replacement demand should increase more than total numbers, being over 5 % and 4 % respectively in the two five-year periods considered. The total demand for pumps in agriculture (new and replacement) would thus increase over the said five-year periods at a rate of 3 % and 2 % in the centre-north and of about 5 % in the Mezzogiorno. The higher growth rate in the Mezzogiorno is due to the increasing proportion of replacement demand attributable to these regions where numbers in use have grown very rapidly, mainly in the last decade alone.

Estimates of the future demand for water-circulating pumps for heating plants, in new residential and non-residential buildings (erected for use as offices, schools, various services, etc.) are based on the forecasts of building trends in the centre-north and in the Mezzogiorno, and in communes with population above and below 20 000 inhabitants, prepared *ad hoc* for the present study.

(1) In fact, for each consumer sector, both the retrospective demand statistics and numbers in use constitute very broad estimates; these have been used for cross-checking in determining replacement demand. The future increase in numbers, originally estimated for 1963, is based on the "new" demand calculated from programmes and investment forecasts for the individual sectors.

These estimates use the forecasts of new buildings and individual dwellings heated by central heating in 1970 and 1975 which were used earlier when analysing the market for central heating radiators and are used again later in dealing with the market for oil burners. These estimates include the demand for centrifugal pumps deriving from pre-existing buildings and single dwellings and non-residential buildings in which an oil-fired central or autonomous heating plant is installed. Specifically the demand for these pumps is obtained from the forecast series for the installation of new burners assuming, as already stated, that on average each heating plant will have two. The replacement demand however is based directly on the retrospective demand figures and on the number of such pumps, taking into account their average life.

The results of the forecasts show that the demand for pumps for heating plants for residential buildings will increase in the first five years, both in the centre-north and in the Mezzogiorno, at a rate of about 12 %, and in the following five years at rates of 5 % and 8 % respectively. It should be noted that these high growth rates, especially in the period 1965-70, are influenced by a growing replacement demand, which is becoming substantial during the actual period studied, following the years when hot-water heating systems were installed on a massive scale throughout Italy, including the south, both in new buildings and in those already existing with or without traditional systems.

Likewise for the similar demand for heating plant in non-residential buildings, the considerable increase over the first five years covered by the forecasts—a growth rate of about 11 % both in the centre-north and in the Mezzogiorno—is mainly due to increasing requirements to replace existing pumps, whereas new demand follows a relatively moderate tempo. In the following five years, whilst replacement demand is settling down, although more slowly in the southern regions, new demand, due to an expected acceleration in the trend of non-residential building, will show a considerable increase. As a result the overall demand for pumps for buildings is expected to grow by at least 9 % per annum between 1970 and 1975.

For centrifugal pumps used for raising water in urban buildings, "new" demand grows slowly until 1970, then declines, while replacement demand again assumes growing weight. This assumes that as new pressure mains are constructed, such pumps will no longer be used. It should however be noted that, even in the future, over 60 % of demand would come from the Mezzogiorno. For the reasons explained, demand, including the growing replacement demand, should increase at a rate of 7 % in the first five years, and then level off in the following period.

The forecasts of demand for pumps for aqueducts are based on the construction of new aqueducts programmed or under study. Based on the rate of construction the corresponding demand for centrifugal pumps for

new conduits should rise by about 2 % annually over the whole decade, reaching about 1 % for the centre-north and 3 % for the Mezzogiorno. Having regard to the life of these pumps and to the development of construction in the past, replacement demand has no appreciable influence on the trend of total demand, which practically coincides with the rates stated above.

The demand forecasts for centrifugal pumps for general and specific plants of the industries considered follow the forecast trend of heavy investments in the said plants by those industries (1) and take into account a certain proportion required as spares for maintenance and periodic overhauls during the economic life of the plants in question; it is only within these limits that a replacement demand for these pumps can be referred to.

Specifically, for plants in the petrochemical sector, the demand for centrifugal pumps will remain practically unchanged in the next decade; in fact, new demand will decline up to 1970 and this decline will be compensated only by the increase in replacement demand deriving from plants constructed in the previous decade.

For centrifugal pumps in plants belonging to the chemical and related sectors, both new and replacement demand will increase at an annual rate of 8 % over the decade, corresponding roughly to the forecasts of investments and growth of production in this sector. From the regional standpoint, demand will show growth rates of the order of 9 % in the centre-north and 7 % in the Mezzogiorno. The demand for centrifugal pumps in plants from the mechanical engineering sector, where new installations are involved, will not regain the 1963 peaks until 1970, and will then increase in the following five years at a rate of 6 - 7 %; replacement demand will increase at the rate of 3 - 5 %. Overall demand for these pumps will not exceed a growth rate of 6 % in the period 1970-75. (5 % in the centre-north and 7 % in the Mezzogiorno).

Estimates of the centrifugal pumps required in making industrial products which use them as inputs reflect the forecast trend of production in the user sectors. In particular, the demand for centrifugal pumps for machine tools is based on the production forecasts for the latter contained in project 5.2.5, taking into account the relation previously established between centrifugal pumps fitted and machine tools produced. The same method has been used to forecast the demand for centrifugal pumps installed in burners, production of which is analysed earlier in the present project.

Finally, given the variety of uses and considering that they represent less than 5 % of total demand, the future demand for centrifugal pumps employed in other unclassified uses, has been assumed in the aggregate to have an annual growth rate of around 5 % (5 % in the centre-north, 5 - 6 % in the Mezzogiorno).

Summarizing, the internal demand for centrifugal pumps, arrived at by combining the various expansion rates for the user sectors described above, should increase 8 % per annum in the period 1965-70 and almost 6 % annually from 1970 to 1975. Consequently demand should reach 19 000 t in 1970 and should exceed 25 000 t in 1975 (see Table 5.2.3 - III).

It should be emphasized that a growing contribution to the increase in demand is expected from replacement requirements, which currently represent little over one third of the internal demand, and will constitute over one half in 1975. (In the first five-year period replacement demand, with a growth rate of 11 %, will continue to reflect the high trends of total demand experienced in the past years of economic boom). "New" demand will show a limited expansion (5 % in 1965-70; 3 % in 1970-75). Another aspect to be carefully considered is that, generally, over one half of the increase in the demand will in fact depend—directly or indirectly—on the activity of the building industry; the latter is currently passing through a period of crisis, which should be overcome by the launching of a vigorous policy.

From the regional viewpoint, the demand for centrifugal pumps is likely to increase during the next five years at a higher rate in the centre-north than in the Mezzogiorno (8 % compared with under 7 %); it is only in the following five-year period that demand in the south is expected to show a slightly higher rate of growth. However, over the whole decade the Mezzogiorno will contribute about 30 % to total demand, with an appreciable absolute increment estimated at about 7.7 thousand t in each of the two future five-year periods. On the other hand, in view of the low incidence of transport costs on the value of centrifugal pumps and the insignificant weight of this charge when the total production costs of firms located in the north and south are compared when examining the possibilities for a major new project, the market must be viewed in the full national context.

Taking into account the forecasts of national demand, and of the trend of Italian exports which may reasonably be expected to show an increase of 5 % up to 1970 and 4 % up to 1975, and also assuming, notwithstanding the recent downward trend of imports, that the latter will recover at similar rates to those for

(1) The forecasts used in the present study, although formulated autonomously and based on other official and unofficial information, agree in general with those of the Confederazione Generale dell' Industria Italiana. See "Servizio Studi e Rilevazione". "Le prospettive dell'industria italiana 1965-1968" - Rome 1965. It is obvious that the approximate correspondence between these forecasts refers solely to the "new" demand for centrifugal pumps, and not to the replacement demand, since we are not dealing here with total investments but with assets of a specific type having their own definite average life.

exports, Italian production of centrifugal pumps should exceed 21 000 t in 1970 and almost 28 000 in 1975. These increases in production would correspond to annual growth rates of 7.5 % in the first five years and 5.5 % in the second, being slightly below those for internal demand. Production of centrifugal pumps should therefore increase by over 6 000 t in each of the five-year periods covered by the forecasts (see Table 4.1.8 - XXI).

The market for oil burners in the EEC

Similarly to the position noted when starting the market analysis for centrifugal pumps, difficulties no less great arise when we come to study the available statistics on burners. In fact, the production and foreign trade statistics for oil burners in the individual member countries are not sufficiently detailed (they include solid fuel burners), and some are expressed numerically and others by weight. For purposes of comparability, estimates of the EEC market expressed in a common unit of measurement had to be made on the basis of the available data and direct information. Since most production statistics relate to numbers, this was the unit of measurement chosen. In interpreting the results obtained, it must be remembered that they refer to very broad estimates (not even the conversions from weight to number can be described as satisfactory) and that, in general, the average weight of burners for heating systems in buildings (15-35 kg) is lower than that for industrial uses (even above 100 kg) (1).

The Community market for oil burners of all types expanded rapidly by 27 % per annum between 1959 and 1963 (see Table 4.1.8 - XXII). Internal demand increased at a rate of 30 % in the period considered and external demand (exports) by 9 % per annum. Production was sufficient to cover demand, and during the period increased at a rate of 31 %; imports increased by 3 % only.

Within the limits of the statistics and estimates used, it is certain that the substantial expansion which has occured in the market for oil burners in the EEC is due primarily to the replacement of solid fuel burners by oil burning types with the rapid installation of central heating systems in new and existing buildings in some countries, sustained by a considerable development of the building industry.

In 1963 Community production reached 437 000 burners, imports 48 000 and exports to the rest of the world 56 000; inter-community trade amounted to 47 000 burners.

Of EEC imports, just over 2/3 originated from EFTA countries (in the order Switzerland, United Kingdom, Sweden and Denmark) and about 1/3 from the USA. Of exports, 40 % went to EFTA countries (Switzerland, United Kingdom and Denmark) another 40 % to countries of the Mediterranean basin and Middle East and the remainder to various countries in Asia, the American continent and East Europe.

Whilst trade with the rest of the world had shown an annual growth rate of 6 % in the years 1959-63, inter-community trade had expanded at a rate of 25 %. The only country appearing as a net exporter within the EEC was the Federal Republic of Germany.

The market expanded considerably in all member countries, but the rate of growth of internal demand was above the EEC average in Germany and France, and below it in the other countries.

As for the production of member countries, Germany contributed 40 % of the total with 175 000 burners and France almost 30 % with 127 000, followed by Italy with 90 000. Belgium, Luxembourg and the Netherlands together produced 45 000.

In the EEC, there are three major producers of oil burners with outputs of the order of 30 - 40 000 per year, located respectively in Italy, the Federal Republic of Germany and France: of these the largest producer is the Italian. In the Netherlands, the largest producer does not exceed 25 000 burners per annum. There are also a few undertakings turning out around 15 000 burners/year, including two in France and two in Italy, apart from various others making about 8 - 10 000 units (5 in Germany, 3 in Italy).

In order to make a correct assessment of the dimensions of the larger producers in the EEC, it is necessary to state first of all that, except in Italy, production in the main refers to burners for gas oil, not heavy oil (2). As already noted, there are considerable structural differences between these two large classes of burners; the most substantial relates to the external structure. Whereas in gas oil burners this consists of a simple casing of deep-drawn sheet metal, in the latter type it is the body of the appliance, formed by an assembly of cast elements, requiring a substantial amount of machine finishing. Since the other parts and component assemblies of both classes of burners (motor, electrical switch gear, special pump and valve in the former, pump and compressor in the latter, if of the low pressure type, etc.) consist almost entirely of standard and commercial products supplied by intermediate industries, it follows that, whereas the production of burners in the other member countries

(1) The wide variability in the weight of burners in the EEC countries is also due to the structural characteristics of the burners themselves, depending on the type of liquid fuel used. Other things being equal, burners for gas oil (liquid naphtha), have a lower weight than those for heavy oil, and the latter type predominates on the Italian market, although not in other EEC countries, due to the tax on fuel.

(2) In the EEC countries, with the exception of Italy, gas oil burners form a large part of the production for heating in offices and for industrial uses. This is due to the fact that there are regulations against atmospheric pollution which limit the use of heavy-oil burners, and/or because, as a result of fiscal duties, the price of gas oil is in line with that of heavy oil.

is reduced practically to assembly operations, in Italy by contrast the main part of the productive cycle is concentrated on machining operations. For equal productive levels among undertakings in the EEC, this leads to a profound difference between their productive structure (equipment, plant, labour) which limits the above comparison.

Burners are also marketed quite differently in Italy as compared with other member countries, where producers usually sell to specialized firms manufacturing heating plants which, in turn, supply complete plants to installers (for example, for plants for heating individual buildings and dwellings, the complete set of equipment comprising burner, boiler, filters, piping system for the fuel, thermostats, miscellaneous electrical equipment, etc.). In Italy it is in most cases the installers themselves who obtain the various plant components from different suppliers, so that burners are delivered directly by the makers to the installers.

As will be noted in Chapter 5, it is probable that, for reasons of public health (pollution of the atmosphere, etc.) and on other grounds, the tax on gas oil will be reduced, thus allowing the adoption of the corresponding types of burners. On the introduction of these measures, the pattern of production in this sector would undoubtedly tend to come into line with that of the other EEC countries, although some heavy oil burners would obviously continue to be made for special industrial uses and for export to user countries.

As regards the future, demand for oil burners in the EEC should remain high but is unlikely to maintain the exceptional rate of increase recorded in years prior to 1963 because, among other factors, demand for conversion of heating systems (from coal to liquid fuel, etc.) is becoming exhausted in most countries.

On the basis of the normal growth trends in the user sectors—i.e. house-building, industry and services using such equipment for various purposes—it can be assumed, allowing for replacement needs, which will become increasingly important in comparison with the past, that Community demand may continue to expand by 13 % per annum up to 1970 and by 9 % annually from then until 1975. On this basis, EEC demand would exceed 1.1 million burners in 1970 and would touch 1.6 million in 1975.

The market for oil burners in Italy

It is estimated that in 1963 Italian production of oil burners (1) reached 90 000. This figure was obtained with other market data, by direct inquiries from producers in this branch of activity. Production had risen substantially in the immediately preceding years by an average of nearly 23 % per year (see Table 4.1.8 - XXIII).

In the same year, imports amounted to 9 000 burners, mainly of types other than those for house-heating especially burners for plants using light oils.

The average weight per imported burner was about 30 kg. From 1959 to 1963 imports increased faster than production, with an annual rate of 32 %. More than half the imports came from member countries of the EEC (largely from the Federal Republic of Germany); such imports are estimated to have risen by 50 % per annum.

Italian exports of burners slightly exceeded imports in the year under consideration. Out of about 10 000 exported, roughly one-third went to Community countries and the remainder to countries round the Mediterranean and other countries, including the members of EFTA. A substantial proportion of Italy's exports, particularly to Mediterranean countries and the Middle East, consisted of burners for heavy oils and refinery waste products; in this field Italian industry is technically advanced and very competitive.

Over the period exports rose at an annual rate of 24 % which kept pace with the growth of national production, but was below the rate for imports. The average weight of exported burners was around 50 kg each.

On the basis of direct information from producers for the first half of 1965, the following levels of production and foreign trade are estimated for that year: production 97 000 burners, imports 10 000 and exports over 12 000 (see Table 4.1.8 - XXIII).

Comparison of the estimates for 1965 with those for earlier years would appear to indicate a relative slackening of overall demand and supply on the Italian market in the last two years, which were characterized by an unfavourable economic situation and a special crisis in the building industry, which absorbs over 80 % of supplies for the internal market (the other user sectors, mainly represented by industry, absorb the remaining 20 %). In particular, internal demand appears to have increased by a little over 3 % and production by 4 % owing to limited growth in net imports.

It should again be stressed that Italian production consists very largely of heavy-oil burners and includes only a small proportion of gas-oil burners, owing to the pattern of internal demand created by taxation which renders the use of gas-oil for heating uneconomic. The higher indirect taxes on gas oil in comparison with heavy oil appear to be attributable—apart from revenue considerations—to the fact that the pattern of refinery output in Italy includes too much heavy fuel oil in relation to normal marketing possibilities. It is in any case a fact that the shape of internal demand in Italy is responsible for the special

(1) The present analysis excludes in principle, unless specifically mentioned, the other types of burners (burners for pulverized solid fuels, etc.), which have for some years been clearly declining in terms of demand and production (they now account for less than 10 % of total production of burners).

pattern of burner production which differentiates it from that of the other EEC countries mentioned earlier.

There are about 60 manufacturers of burners in Italy, all located in the Centre and North. The largest manufacturers (producing over 8 000 burners per year) are eight in number. The biggest firm, which is also the largest in Europe turns out 35 000 burners annually and has capacity for about 40 000; it is followed by two other firms each producing 15 000 burners a year. (1) The economic size required to ensure a high degree of competitivity in the manufacture of oil burners, mainly for domestic heating, is of the order of 15 000 units per year, while for the manufacture of burners for other purposes, averaging over 50 kg in weight, the corresponding level may be put to around 8 - 10 000 units per year.

In this connection it is interesting to note that, in view of the seasonal nature of internal demand for burners, deliveries are concentrated in the months July to October; the seasonal pattern of deliveries creates problems of manufacture and storage. To avoid holding excessive stocks of the finished products, manufacturers try during the remaining months of the year to concentrate on mechanical workshop processes, leaving the last months of the period for assembly. There is nevertheless the problem of pronounced seasonal variations in processing and assembly operations, creating disequilibria in the use of production equipment and skilled labour. With a view to running at full capacity and making better use of labour in the various departments the manufacture of burners is therefore generally coupled with other technically similar lines of production, if possible with a different seasonal pattern. Most establishments which make burners, including the largest ones, also manufacture air-conditioners and other heating equipment such as ovens, etc. However, such outputs do not appear to solve the above-mentioned technical and economic problems.

If, as a result of a change in the taxation of fuels, production were to be concentrated mainly on gas-oil burners, instead of heavy oil burners, manufacturers would be faced with a conversion problem. There would be a change from a production cycle including a substantial proportion of genuinely mechanical processes to one in which assembly operations would predominate, resulting in the non-utilization of substantial investments in production equipment and skilled labour.

Within the present structure of this branch of activity, the potential output of the Italian burner industry in 1965 is estimated at over 110 000 units per year. There are no reports of any important plans for the expansion of existing firms, as least as far as the largest manufacturers are concerned, nor of any new major projects.

As already stated, the Italian market for burners also differs from that of other Community countries on the distribution side because sales are made direct from the manufacturers to installers. The manufacturing firms sell through their own organization of branches or of representatives holding stocks. The large firms have ten or more such depots situated in the main buying centres.

The list price of a medium-type burner for domestic-heating (26 kg, with a thermal capacity of 84 000 cal/h, 0.50 HP motor, consumption capacity of 2-8.5 kg/h and a device for automatic lighting and extinguishing at a preset temperature) is at least 170 - 180 000 lire; the price charged by branches to installers on large orders may show a discount of up to 35 % and thus be 110 - 115 000 lire for such sales; for small and medium-scale sales the selling price is 145 000 lire.

These prices include the cost of packing and transport at the maker's expense. The cost of packing, consisting of a corrugated cardboard carton, is about 500 lire per burner. The average transport cost for burners is 300 - 330 lire for deliveries in the Centre and North and 500 - 550 lire to the continental Mezzogiorno.

For overseas exports a wooden box containing four burners is used in addition to the standard cardboard packing; the price of this additional packing is about 1 300 lire per burner. The cost of transport from a firm located in the Milan area to the port of shipment, free on board, is 400 lire per burner. From a firm situated near a port this cost would be reduced to 250 lire.

For direct sales to overseas foreign markets, the price per burner is around 125 000 lire, which, allowing for refund of the IGE and the payment of export premiums, gives a unit return equivalent to that earned on the internal market.

For the forecasts for internal demand, irrespective of whether this will in future be mainly for heavy fuel oil or gas-oil burners, see Table 4.1.8 - XXIV, which summarizes the market projections for Italy for 1970 and 1975, taking 1965 as the reference year.

For the base year, total demand for oil burners, derived from the aforementioned production and foreign trade data, was checked by determining and analysing demand from the various user sectors and the proportions of such demand attributable to increases in the number of burners in use and replacement purchases respectively.

By combining the fragmentary data from some earlier studies with information obtained by direct enquiries from heating-plant contractors and manufacturers, the distribution of oil burners in Italy was estimated for 1963 and subsequently calculated for 1965. In the

(1) The above-mentioned outputs and capacities refer to production of all burners, including those using pulverized solid fuel.

latter year, out of a total of 445 000 burners, some 309 000, or 70 % (249 000 in the Centre and North and 60 000 in the Mezzogiorno) were installed in residential premises; 94 000 or 21 % (78 000 in the Centre and North, 16 000 in the Mezzogiorno) in other buildings; 42 000 or 9 %, for industrial uses and services (it should be borne in mind, especially for industrial uses, that these are numbers and not weights).

With regard to "new" demand, the inquiries showed that in the Centre and North 85 % of new buildings for residential use, in communes with over 20 000 inhabitants, are fitted with heating units with oil burners; for communes with less than 20 000 inhabitants the figure is 45 %. In the Mezzogiorno these figures are lower, at 45 % and 16 % respectively (see "Market for sheet-metal radiators in Italy"). As already mentioned, the remaining buildings have various types of heating (these are mainly small individual dwellings using stoves, etc.) and, especially in the Mezzogiorno, a large number of buildings are completely without heating. Furthermore, there would appear to be a certain proportion of old buildings (communal dwellings, individual dwellings, etc.) in which heating plant fitted with burners (especially central heating plants) is being installed or where conversion from heating with coal, etc., to an oil system is in progress (1).

Among the newly erected non-residential buildings (services, industries, etc.) in the Centre and North, 80 % are said to be equipped with heating requiring the use of burners; in the Mezzogiorno the figure is 70 %. Here again there appears to be a certain proportion of older premises in which heating with burners is being installed (2).

By applying the above percentages directly to the number of new buildings (residential and non-residential) which, according to the normal trend of growth forecasts worked out for this study, should be put up in 1965 in the geographical areas and types of communes in question, it was possible to calculate the corresponding demand for burners for residential use (63 000) and for other buildings (18 000), as shown in Table 4.1.8 - XXIV.

The specific demand for burners for non-residential buildings and other uses (industrial, etc.) has been estimated at about 18 000 and 14 000 respectively. While demand for burners for non-residential buildings in the reference year would appear to have been at a slightly higher level than in 1963, that for other uses, mainly in industry, is put at 30 % lower than 1963, the last year of the boom.

(1) In Italy the corresponding demand is estimated as 6 000 burners per year nearly all in the Centre and North.
(2) This is a much smaller demand of the order of one thousand burners per year in the whole of Italy, mainly in the Mezzogiorno.

Demand for replacements in the base year was obtained by reference to demand statistics for the user sectors, allowing for expected average life (generally 8 years; for industrial uses, services, etc.), and using the distribution data for burners in that year as a check.

Although the figure for internal demand in 1965 obtained from individual estimates for the user sectors was of the same order as that obtained direct from the estimates of production and foreign trade (only minor adjustments were necessary), it was not found possible to set any definite figure for the increase in stocks and thus to take this factor into account. The few data available suggested that there had been no appreciable changes in stocks during the year in question. On the other hand, it might be reasonable to assume that they increased, in view of the crisis in building throughout the year; it may be that the "normal" demand indicated above for residential buildings is not actually attained unless the anticipated percentage of new buildings with heating (as compared with the total) rises more quickly. According to the trends, the proportion of new buildings with heating in the total of buildings constructed will undoubtedly increase further in Italy in the coming decade.

In forecasting internal demand for burners it has been assumed that in the Centre and North, in communes of over 20 000 inhabitants, the percentage of new residential premise with burners will be 90 % of all new buildings constructed by around 1970; in communes of less than 20 000 inhabitants the corresponding percentage is assumed to be 50 %. In the Mezzogiorno the figure for the two categories of communes, should reach 60 % and 20 % respectively.

In the period 1970-75, all the percentages in question are expected to level off at the values reached, since variations in income and other factors should no longer be exerting any significant influence. For non-residential buildings, no appreciable change has been assumed in the percentages of new premises in which burners are installed.

The building growth forecasts worked out specially for the present study, as already noted, and the percentage relationships which have been described, were used to calculate "new" demand for burners for use in residential and other buildings in 1970 and in 1975. The projections also take into account a gradual diminution in the percentage of burners for installation in existing buildings.

The "new" demand for burners for industrial uses has been varied in line with the expected expansion of industry during the period covered ("low" hypothesis of 6 %).

The forecasts for replacement demand reflect, in accordance with the criteria described, the resultant changes in the number of burners installed.

To sum up (see Table 4.1.8 - XXIV), total internal demand for oil burners is expected to reach 164 000 per annum in 1970 and nearly 228 000 in 1975. In the latter year 64 % should be accounted for by installations in residential buildings, 21 % by non-residential buildings and the remaining 15 % by industrial uses.

In 1970 more than 45 % of this demand is expected to be for replacements in the various user sectors, and in 1975 replacement is expected to represent over 53 % of the total.

In terms of growth, internal demand is expected to rise by about 69 000 burners, with an annual rate of increase of 11 %, during the next five years. It seems clear from the above-mentioned data that these rises and rates will be increasingly influenced during the next ten years by demand for replacements, due to the rapid increase in the number of burners installed in the preceding 8 - 10 years and the slackening of this demand in the ten years under consideration.

By geographical areas, total internal demand is expected to increase in the Centre and North by 54 000 burners in the first five years (rate 11 %) and by nearly 47 000 in the following five years (rate 6 %).

In the Mezzogiorno the increase will be smaller, although still substantial, amounting to about 15 000 and 17 000 respectively (rates of 12 and 8 %) (see Table 4.1.8 - XXV).

Assuming an expansion of exports at the rate of 8 % from 1965-70 and 6 % from 1970-75 and an increase in imports of the order of 3 %, and taking into account the above-mentioned levels of internal demand, Italian production of burners should amount to 170 000 units in 1970 and 238 000 in 1975, with rises of the order of 70 000 in each of the two five-year periods, corresponding to an annual growth in output of 11 % up to 1970 and 7 % up to 1975.

The market which will be available to the new unit and its size

In view of the trend of demand and supply in the market and the unit's high degree of competitivity, the level of full production can be put at 2 400 tons per year of centrifugal pumps and 800 tons per year of oil burners (30 800 burners in terms of the average type considered).

The basic production line of the firm would in fact be centrifugal pumps and burners, with possible ancillary lines. With regard to burners the unit would present some original features, being incorporated in a new Italian production complex capable of solving the problems which at present confront other manufacturers (seasonal nature of processing and assembly, etc.; the present combinations of output, such as the coupling of burners with air-conditioning equipment, have left them largely unsolved) and the future problems arising from a possible change-over from production of heavy-oil to gas-oil burners. In that event, the means of production used for purely mechanical processes, which would be released either directly or by scaling down, could in fact be used to make more pumps (including special types for gas-oil burners, both to satisfy internal production needs and, acting as an intermediary unit, to meet the new increased market demand) and for other mechanical processes relating to ancillary production lines, which are referred to further on.

In particular, 10 - 12 % of the centrifugal pumps produced would be of large dimensions ("non-series" in the sense which has already been mentioned several times) and the remainder would consist of current "series" pumps, divided into a dozen types for a total of about 30 models. Production would include both cast-iron and steel types. A similar percentage of the burners produced could consist of types for special uses, but production would still largely be concentrated on series burners, divided into eight or nine types comprising about twenty models. In addition, subject to the preferences of the entrepreneur responsible for the project, the plant could turn out as a side-line up to 200 - 250 tons of hydraulic jacks and electric hoists, which, as previously discussed in 4.2., offer certain marketing possibilities.

Considering only the main products, i.e. centrifugal pumps and burners, the normal output of the unit could be distributed by market areas as follows:

	Unit of measurment	Internal market			Export	Total Output
		Total	Centre-North	Mezzogiorno		
Centrifugal pumps	t	2 000	1 200	800	400	2 400
Oil burners	t	720	510	210	80	800
	(in '000)	(27.7)	(19.6)	(8.1)	(3.1)	(30.8)
Total		2 720	1 710	1 010	480	3 200

With regard to output of centrifugal pumps the unit would rank, by volume, among the leading Italian producers in this field. With the high degree of competitiveness guaranteed by its up-to-date production equipment it should be able to export at least 15 % of the expected output to the international market, mainly to the countries round the Mediterranean and other countries where demand for these products is growing rapidly. The quantity exported would constitute under 10 % of Italian exports of centrifugal pumps expected in 1970.

Sales on the internal market would represent about 10 % of the corresponding internal demand in that year and half of the increase in that demand in the period 1969-71. Thus the proposed unit can be introduced into the Italian market without reducing the selling margins of the existing firms; in fact, it should even allow improved use of existing capacity (in particular, a possible change from single-shift to double-shift working by the biggest producer).

Although the expected regional distribution of demand in 1970-75 is about 70 % in the Centre and North and 30 % in the Mezzogiorno, it is believed that, owing to a number of factors (being the only large firm of its kind in the Mezzogiorno, the resultant advantages as regards marketing organization, etc.), the firm will be able to sell at least 40 % of its products in the southern areas; this would be approximately equivalent to half the increase in demand in these areas in the years 1970-71.

There is no doubt that, in comparison with a plant located in the north, the unit in question would be at a slight disadvantage as regards distance from the marketing centres. The small effect of transport costs on total is, however, insignificant in a general assessment of market prospects.

As far as burners are concerned, the proposed unit would be the second-largest in Italy and among the biggest in the EEC. 10 % of its sales should go to the international market and the remaining 90 % to the internal market. Foreign sales may in fact exceed this percentage in view of the trend of Italian exports in this field of the potential markets in some Mediterranean countries and of the potential demand for burners for industrial use in developing countries in the Middle East and elsewhere. The unit's contribution to Italian exports would be 17 % of the figure forecasts for 1970.

The volume which the unit would have to sell on the internal market would represent a little over 16 % of internal demand in 1970 and would absorb 60 % of the increase in demand in the three years 1969-71. The pattern of sales on the home market could be 30 % to the Mezzogiorno and 70 % to the Centre and North, even though it is expected that in 1970-75 the distribution of internal demand will be nearly four-fifths to the regions of the Centre and North and a little over one-fifth in the southern areas. This slightly greater relative penetration of the southern market is made possible by the factors already noted concerning pumps. Similar considerations also apply to the insignificant incidence of higher transport costs owing to the territorial distribution of sales, in relation to that of an equivalent firm in the North.

Unit IV

MANUFACTURE OF FARM MACHINERY

The farm machinery market in the EEC

The mechanization of agriculture in the EEC countries has shown marked development particularly in the last decade and, in some areas and for some types of machine, has already reached a high level, not far short of saturation. Under the combined effect of the implementation of the agricultural Common Market, the rural exodus and subsequent rationalization trends in agriculture, stimulated by the need for increased productivity, the demand for farm machinery and therefore production have been growing rapidly in all member countries over the last few years.

Figures on the growing number of tractors in the EEC countries (see Table 4.1.8 - XXVI) help to give a general picture of the way mechanization has progressed.

As the table shows, the number in the EEC countries increased considerably between 1955 and 1963, rising from less than 1 million to about 2.4 million. The total increase for the period was 146 % which is equivalent to an average annual growth rate of about 12 %: except for France (14 %) the annual growth rate for the member countries was uniform (approximately 11 %).

In fact it can be said that, at 18 ha. of arable land per tractor (1), the number of tractors in the EEC had practically reached saturation level in 1963. This index, which was 44 in 1955, had already fallen to 24.5 in 1959—a very substantial drop—and shows a further decrease in 1963.

Examination of the individual countries shows that the relative positions did not change over the period from 1955 to 1963: the Federal Republic of Germany has the lowest ratio (18 in 1955 and 8 in 1963) and Italy the highest (90 and 39 respectively) (2).

It must be recognized that a summary picture such as that based on the tractor fleet can obviously conceal widely differing situations, particularly in regard to

(1) As can be seen from Table 4.1.8. XXVI this index has been calculated taking the area of arable land in 1963 (and also 1959) to be equal to that in 1955 so as to be able to make valid comparisons over the period in question.

(2) The differences that exist are due essentially to differences in the character of the arable land (in Italy it is predominantly hilly and mountainous unlike the other member countries) and also to the breakdown of agricultural holdings by size (Italy has the lowest average acreage per holding).

conditions and prospects for other, no less important, individual types of machine in the countries in question.

The progress and present position of mechanization in the EEC, as described above, are reflected in recent supply and demand trends for all types of agricultural machines (including tractors) in the member countries during the 1959-63 period. In this connection see Table 4.1.8- XXVII which summarizes the basic market data expressed in units of account related to constant 1963 prices ([1]).

These figures demonstrate how the internal demand for farm machinery in the Community continued to expand between 1959 and 1963 at an average annual rate of 5 %. Production increased at a rate of a little over 4 %, with the consequence that imports from third countries increased. These reached a value of 128 million units of account in 1963 with a growth rate of 22 % compared with an increase in exports—173 million units of account in 1963—of about 9 %.

During the period concerned intra community trade showed a marked rising trend (16 % growth rate) and reached 153 million units of account in 1963. This trade within the Community left the Federal Republic of Germany as a net exporter with all the other member countries net importers except Belgium/Luxembourg where the position is roughly in balance.

Internal demand growth rates in the individual countries reflect the degree of mechanization reached, as noted above. Thus the Federal Republic, whose agriculture had reached a high level of mechanization in 1963, shows the smallest growth of internal demand (under 2 %) followed by France at around 3 %. In Italy, on the other hand, where the degree of mechanization was the Community's lowest, internal demand, again between 1959 and 1963, increased at a rate of about 18 %. The Benelux countries occupy an intermediate position (rates of 6 % - 11 %).

But it should be borne in mind that the market for farm machinery in general is very much influenced by the agricultural tractor market which, as already stated, is reaching near-saturation in the member countries with the exception of Italy and, to a lesser degree, Belgium/Luxembourg; for this reason demand prospects for agricultural tractors in the EEC are limited ([2]).

It is therefore useful to exclude tractors from our study of the agricultural machinery market. As can be seen from Table 4.1.8 - XXVIII the growth rate of internal demand within the EEC in recent years (which, as we have seen, was 5 % for all farm machinery in general, including tractors) works out at 7 % without tractors; total demand also showed a greater increase (about 8 % as compared with a little more than 5 %).

In general it can be stated that EEC production of agricultural machines, excluding tractors, matched the expansion in internal demand, even though imports from the rest of the world show a tendency to exceed exports. In 1963, nevertheless, the former amounted to 49 million units of account as against 112 million for the latter.

In more detail, 59 % of EEC exports to other countries in 1963 went to EFTA countries, mainly to the United Kingdom, Austria, Switzerland and Denmark in that order. Exports to other European countries not on the Mediterranean coastline amounted to 6 % of the total, and those on the Mediterranean took nearly 18 %, about half of which went to Spain. Sales to non-Mediterranean African countries represented 6 %. Exports to America reached 7 % divided practically equally between North America, mainly Canada, and Latin America. The remaining 4 % was spread over the rest of the world.

As regards EEC imports, 75 % of the total came from EFTA countries, principally the United Kingdom (41 %) and Sweden and Denmark (27 % between them). Other imports came practically entirely from the USA (23 %).

By 1963, trade in agricultural machines, excluding tractors, between Community countries had risen to 97 million units of account, showing an increase of 18 % over 1959; the Federal Republic in particular, and also Belgium, appear as net exporters, whilst in other countries imports exceed exports.

Examination of the figures for the individual member countries confirms in each case the situation already noted, namely a greater increase in internal demand for farm machinery, excluding tractors, than for the same category, including tractors. In detail, internal demand in the Federal Republic, which, for all agri-

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([1]) Units of account equivalent to US dollars.

([2]) Between 1959 and 1963 internal demand for agricultural tractors in the EEC showed a relatively small overall increase, with an annual rate of 2 %. However, since production decreased slightly during the period, imports increased considerably, at a rate of 26 %, whereas exports rose at an average annual rate of 3 %. Inter-community trade in tractors increased at a rate of about 13 % during the period under review; the Federal Republic of Germany and Italy were net exporters, whilst the other member countries were net importers. It should be noted that internal demand for tractors between 1959 and 1963 followed a very different course in the individual members countries: the greatest increase was in Italy (a rate of 15 %)—where, as noted, the number of tractors, especially at the start of the four-year period concerned, was very small—followed by Belgium/Luxembourg and the Netherlands. In the Federal Republic there was a fall (a rate of — 3 %) a fact which signifies that saturation had already been reached. In France the increase was slight (1 %). Confirmation of these market trends is provided by a recent decrease in sales both in the Federal Republic (where they fell from 100 600 in 1962 to 95 700 in 1963) and in France (from 81 650 in 1959 to 77 630 in 1963): in these two countries a fall in production was recorded during the period. Neither does the evolution of demand in other European countries and in the rest of the world promise any considerable export possibilities.

cultural machines, had risen at a rate of 1.6 %, shows a growth rate of 4 % when tractors are excluded; for France the two corresponding rates were 3 % and 4.5 %; for the Netherlands they were 11 and 14 %; for Italy 18 % and 20 %. Belgium is the exception where the figures are slightly the reverse.

The observations made so far show that the EEC market for farm machinery presents a variety of situations and prospects in the different member countries and, of course, according to the type of machine.

In general it may be concluded that certainly for the next ten years, under the stimulus of national agricultural policies and joint EEC efforts to establish the agricultural Common Market, demand for the machines in question will continue at a substantial level even though lower than that of recent years. It is reasonable to forecast that, among member countries, demand will certainly continue to show one of the highest rates of growth in Italy.

The farm machinery market in Italy

In Italy, the mechanization of agriculture is still far below the average level reached in the EEC as a whole. As we have seen from observations on Table 5.2.4 - I when considering the EEC market in general, there was still only one tractor for every 39 ha. of arable land in Italy in 1963 compared with an average for the Community of 18 ha. This situation may be partly explained by the character of Italian farm land, the structure of land ownership and other factors as already mentioned but it is also due to the backwardness and inadequate economic basis only too characteristic of substantial part of the country's agriculture. It must also be borne in mind that precisely because of some of these characteristics and factors, an evaluation of the degree of mechanization of Italian agriculture based purely on the number of tractors and coefficients expressed in terms of area is likely to be less reliable than for other member countries because the indices used are less representative. It is especially necessary in the case of Italy to consider not only tractors but also other classes of agricultural machine.

However that may be, the summary market figures given in Table 4.1.8 - XXVII for all farm machinery show the efforts being made by Italian agriculture to reach the higher level required for the implementation of the European agricultural Common Market. At constant prices (1), internal demand rose from 118 million units of account in 1959 to 230 million in 1963 at an annual growth rate of more than 18 %. To satisfy the growing internal demand, production rose during the same period at a rate of more than 16 %. With the simultaneous increase in exports (rate: 19 %) this expansion of production was not sufficient to keep pace with the total demand. Imports thus rose from a level of 16 million units of account in 1959 to more than 46 million in 1963 (rate: 31 %).

For reasons already set out in the section dealing with the Common Market it is best to exclude tractors from a general examination of the farm machinery market. According to the figures given in Table 4.1.8 - XXVIII, internal demand for agricultural machines excluding tractors reached a value of 69 million units of account (again at constant prices) in 1959; in 1963 this had become 144 million with an average annual growth rate of more than 20 %, which as already noted, was the Community's highest. In 1963 the production of such machines had reached 120 million units of account (growth rate: 18 %), exports had risen to 6 million (34 %) and imports to 30 million (38 %) with a deficit of more than 24 million units of account. Apart from underlining the steep rise in such imports it should be borne in mind that they are becoming more and more diversified and specialized so as to meet, in ever increasing measure, the final user's requirements.

Taking 1963 in detail, more than 75 % of the total Italian imports (equivalent to 23 million units of account) came from member countries of the EEC —about half of them from the Federal Republic of Germany. Imports from the rest of the world came principally (79 %) from EFTA countries, mainly the United Kingdom, and the remainder from the USA. Only one third of Italian exports went to EEC countries, mainly France; of exports going to third countries 20 % of the total was absorbed by EFTA countries, 14 % by East European countries, 8 % by countries in the American continent (principally Latin America) and a good 50 % by Mediterranean countries (Spain; Yugoslavia, Greece, Turkey, Libya, etc.)

In a general study of the farm machinery market in Italy certain aspects and characteristics of supply call for special comment. Ignoring the output of ten or so plants, farm machinery is manufactured in Italy by several hundred medium-small and small firms whose annual turnover in some cases does not exceed a few tens of thousands of units of account. In general terms, production in this branch of activity is in the hands of undersized firms or craft undertakings. This is the result of old ways of thought that, generally speaking, have not accepted modern concepts of production (production methods and organization) and regard present production as an optimum to be maintained. Most of these manufacturers do not use the most suitable materials and, in the absence of proper designing, do not produce parts for the individual types of machine to a standard pattern that permits easy substitution of spares; all these factors lead to considerable difficulty and dissatisfaction for the user. These same manufacturers, even when located in the great industrial centres of central-northern Italy, have a predominantly vertical organization (doing their own foundrywork and forging, etc.) and entrust such work as is given out to local craftsmen.

(1) Constant 1963 prices.

The result is that most of these units are hardly competitive, the market for many firms is mainly "local", and the user, generally speaking, is given inadequate service.

The failure of most manufacturers to realize these problems leads them to complain of difficulty in disposing of their goods on the market and to assert that the sector is a difficult one in which there are definitely no further suitable opportunities of investment. This has no objective support in statistics on demand and recent demand trends and is contradicted by the import figures.

Save for certain exceptions, even the large Italian manufacturers are far from having the structure and size of the largest producers in other EEC countries. Whereas the latter mass-produce in large numbers and some plants employ more than six thousand workers, the former are still limited to small series production and employ a maximum of one thousand workmen. Unquestionably, if account is taken of the progressive establishment of the Common Market and of increasing competition, the favourable prospects offered by the anticipated further expansion in demand can only be exploited in Italy by large modern units. With some exceptions, the large units that already exist are faced with the problem of implementing modern production ideas involving an effective standardization of basic elements and partial constructional standardization of different components rather than enlargement in size. For any new, large establishment such conditions can, in principle, be achieved more easily.

Regarding distribution channels and policy in Italy the large producers mainly use the stocking-agent system, especially for machines used in small-scale mechanization. User service is generally provided by the same agents and, in some cases and areas, by the maker's engineers direct.

A special and very important role in distribution is played by the Federazione Italiana Consorzi Agrari (known as Federconsorzi) (= Italian federation of agricultural associations). Working through the Consorzi Agrari Provinciali [1] (= Provincial agricultural associations) this organization has its own national network of sales outlets for machinery and other agricultural equipment and products covering all rural centres including the small ones. No producer has—or could economically establish and maintain—such a network. By virtue of its extent and other factors it is of extreme importance for producers to have the advantage of distribution agreements with the Federazione.

An important feature is the need for distribution to be associated with credit. The majority of sales are in fact against deferred payment with the aid of loans granted by special agrarian credit institutes for farming operations and land improvement (central and peripheral organizations, agrarian credit sections of ordinary credit institutes) which use funds allocated by the State to grant five-year loans for the purchase of agricultural machines at 3 % interest [2] or 1-2 % in the case of machines associated with improvements to animal farming [3] (motor-mowers, fodder presses, machines for hay-making, etc.). Another kind of aid in the purchase of agricultural machines is a capital account contribution, the maximum level of the grant being 25-35 % of the expenditure [4]. Such grants may also be made to farmers who have already taken or are taking advantage of a five-year loan (but in such cases the amount of the grant is reduced by a specified proportion).

In these circumstances, it is clear that, in general, a major part of internal demand depends on the availability of these special kinds of aid.

Finally it should be borne in mind that competition between manufacturers tends to become keener and keener, whether in terms of price and service or in quality, in relation to customers' specific requirements, which vary considerably from region to region according to the size and conditions of the holding on which the machines are to be used and other factors not excluding subjective influences arising from certain traditions and prejudices. In this context an unsatisfactory solution often adopted is that of making too many types and sub-types of machines so that production units have heterogeneous production lines operated on too small a scale.

In conclusion, it would seem to be confirmed that, on the Italian market for farm machinery, particularly for certain types, there is still substantial scope for increasing production over the next ten years, in view of the expansion of internal demand and in particular the substitution of imports, provided home production itself can supply the quality of goods required by the internal market at competitive prices.

It is clear that a closer analysis of individual machines will lead to more detailed conclusions on market prospects. The analysis in the following paragraphs therefore deals with the main types of agricultural machine, viz: self-propelled combine harvesters, pick-

(1) The Consorzi Agrari Provinciali (Provincial agricultural associations) are limited companies formed by agricultural producers and work in a similar way to co-operatives. At their head is the Federconsorzi.

(2) Act No 949 of 25/7/1952, reproduced in article 12 of Act No. 454 of 2/6/1961 ("Piano verde" "Green Plan") which extends its period of validity to 30/6/1969.

(3) Article 16 of the "Piano Verde". The 1 % applies to loans granted to farmers in Southern Italy, the islands, Venezia Giulia, Maremma Toscana, Lazio and also in areas classified as "mountainous" within the meaning of Act No. 991 25/7/1952; the 2 % rate applies to loans for all remaining areas of the country.

(4) Article 18 of the "Piano Verde". The grant is 35 % for the areas listed in footnote (3) and 25 % for all other areas. These grants are intended for "owner-farmers, share-croppers and tenant farmers, small-holders, on their own or in association, agricultural co-operatives"; for other miscellaneous categories the grant has a ceiling of 10 % of the expenditure.

up balers (fodder presses and straw balers), motor-mowers, motor cultivators, motor hoes.

As will be observed, the list does not include machines of a simpler type which are still produced but are likely to be replaced by other, more complex machines (this is the case of binders and harvesters, replaced by combine harvesters). Again, certain machines used in cultivation, which may also provide a market of some interest, are not dealt with directly; they include self-propelled sowers, manure spreaders, machines for rice planting and cultivation, hay-making machines, etc., which, for a new undertaking of the type planned, may offer prospects for integrated production and sales having affinities, from the engineering point of view, with those of the basic "type products".

The market for self-propelled combine harvesters in the EEC

The market for self-propelled combine harvesters in the EEC has expanded in recent years at a rate of about 3 % (see Table 4.1.8 - XXIX).

Internal demand has increased at a rate of more than 3 %, whilst that from the rest of the world, i.e. exports to other countries, which absorb some 7 500 machines (equivalent to more than 1/4 of Community production), have increased at a rate of less than 1 %. In 1963 half of the exports went to EFTA countries, mainly the United Kingdom, Denmark and Austria; 20 % to Mediterranean countries, principally Spain, Turkey and Syria. More than 10 % of sales to other countries were absorbed by countries in the American continent, mainly Canada.

Internal supply rose more slowly than internal demand, resulting in a sharp increase in imports (56 % from 1959 to 1963), which continued, however, at a modest level in absolute terms.

Within the EEC, trade between member countries increased considerably, climbing in 1963 to 8 500 machines, at an annual growth rate on 1959 of some 14 %. Inter-community trade in self-propelled combine harvesters shows net export movement from the Federal Republic of Germany and Belgium to France and Italy.

Community output of the machines in question in 1963 is estimated at about 32 000 units roughly 2/3rds of which were produced in the Federal Republic and 20 % in Belgium (1). Production trends varied considerably between member countries with vigorous expansion in Belgium and Italy and a decline in the Federal Republic and, more particularly, in France. These trends combined to produce the slight increase, already mentioned, for the Community as a whole.

(1) Belgian production is mainly of combine harvesters built of wood, highly valued by users but of shorter average life.

The largest producer in the Community is in the Federal Republic of Germany and has a capacity of 25 000 combine harvesters a year. Next comes a Belgian firm with an annual capacity of about 9 000 machines. In the other member countries the largest producers, numbering less than ten, have a yearly productive capacity of about 1 000 machines each.

Internal demand in the individual member countries also shows differing trends. The largest increase has been in Italy at a rate of more than 30 %, followed by the Benelux countries at rates of between 6 and 8 % but in the Federal Republic and France demand on the internal market has tended to level off. These differences in the movements of internal demand in the individual countries can be explained by studying changes in their respective fleets of self-propelled combine harvesters as shown by the figures in Table 4.1.8. - XXX.

The total number of such machines in the whole of the EEC rose from about 60 000 in 1959 to more than 142 000 in 1963 with an average annual growth of 24 %. In the same period (and also previously) there was a fall in towed combine harvesters.

The increase was, in all cases, very rapid over the first four years (1955-59); it remained substantial between 1959 and 1963 but the rate of growth was lower. The difference was very marked for all countries and only in Belgium/Luxembourg was there a slightly increased growth rate from 1959-63 as compared with the preceding four year period.

Among member countries, the Federal Republic of Germany and Italy showed the highest growth rates for combine harvesters for both 1955-59 and 1959-63. If 1964 is considered, when the number of combine harvesters in Italy reached 12 300, it will be seen that this was the only country to maintain a high growth rate, of the same order as that recorded for 1959-63.

The present distribution of combine harvesters in the individual countries of the Community is brought out by the relation between area under cereals and number of machines (ha. per combine harvester):

Belgium/Luxembourg	102
France	108
Federal Republic of Germany	52
Italy	662
Netherlands	126
EEC	108

The ratio for the EEC countries as a whole is about 108 which shows that combine harvesters are already well spread but still have plenty of "room" for expansion. The equivalent ratio in the USA is around 60 ha., roughly half the EEC figure.

Within the Community, the ratio shows different values for the various member countries with the lowest figure in the Federal Republic and the highest

in Italy. This reflects the general state of mechanization. As regards Italy, the ratio is in reality lower (about half) if, as an analysis in subsequent pages will show, it is confined to that part of area under cereals that may be considered "combine-harvestable" (3.2 million ha.).

A number of assumptions and comments must be made regarding future numbers of self-propelled combine-harvesters, with which this report is more specifically concerned.

The first assumption is that, over the next ten years, the total cereal-growing area of the EEC will remain substantially the same as it is to-day, i.e. about 21 million ha., bearing in mind that there will probably be a contraction in grain production and an increase in minor cereals for animal foodstuffs.

Another hypothesis concerns the number of combine harvesters in EEC countries in relation to the areas on which these machines may be used; a maximum may be reached in 1975 with a ratio of one combine harvester to every 60 ha. under cereals ([1]) in all member countries except Italy, for which it would seem more realistic to forecast a ratio of around 90, in view of the "combine-harvestable" area on the one hand (of which, moreover, a large part is of a hilly nature) and the present higher value of the ratio on the other.

Assuming that in 1975 90 % of all combine harvesters are self-propelled, the ratio of area under cereals to each combine harvester will be 67 and this index has been taken as a basis for the projections that follow (for Italy the 90 ratio can be related directly to self-propelled combine harvesters whose present strength has been taken as a basis for the forecasts).

The number of self-propelled combine harvesters in EEC countries in 1975 may reasonably be computed as follows:

	Number of units	*Annual growth 1963-75*
Belgium-Luxembourg	8 200	6.7
France	136 000	7.2
Federal Republic of Germany	74 000	0.8
Italy	36 000	11.7
Netherlands	7 300	8.0
	261 500	5.2

Taking into account replacement needs (given an average combine harvester life of about 10 years, on the basis of "normal" use), the above-mentioned growth of numbers combined with a net increase in exports to the rest of the world (5 % per annum, to Mediterranean countries and other geographical areas), an internal EEC demand of about 35 000 self-propelled combine harvesters and a production figure of 42 000 may be forecast for 1970. By 1975 these figures should rise to about 41 000 and 50 000 respectively ([2]).

Between 1965 and 1970 internal demand for these machines should produce an absolute increase of 8 000 in the number in service in the EEC and a further 6 000 between 1970 and 1975; bearing in mind the increase in net exports already mentioned, production should in turn show increases in the two five-year periods concerned of 10 000 and 8 000 units respectively.

Assuming relative saturation by 1975, when numbers should have reached the stated level of 262 000 machines, increased replacement needs, together with possible further qualitative improvements (e.g. replacement of the remaining towed machines by self-propelled machines) and a possible further expansion of net exports to other countries would suggest that in the years following this period Community production should level off at a figure of 50 000 machines per annum.

It must be pointed out that the estimates for 1965 and the projections of production may be considerably exceeded if any new factors should arise permitting major expansion in exports to third countries beyond the modest limits on which the forecasts have been based. This particularly concerns the countries which export most combine harvesters from the EEC, in particular the Federal Republic of Germany and Belgium.

The market for self-propelled combine harvesters in Italy

Together with that of Belgium, the Italian market for self-propelled combine harvesters has shown the greatest expansion in recent years (see Table 4.1.8 - XXIX). Total and home demand rose at a rate of about 33 % between 1959 and 1963; during the same period production increased from a little over 500 to 1 150 machines. With home demand rising from little more than 1 000 units in 1959 to 3 243 in 1963 and production levels being those stated there was a growth in imports, which increased during the five years at a rate of 40 %. Conversely, the level of exports did not reach any significance in absolute figures.

Italian imports came mainly from the other EEC countries, who supplied more than 80 % of the total: the Federal Republic of Germany was the principal source (about 60 %) followed by Belgium. Of exports (slight in absolute figures) about half went to France and the remainder to non-EEC countries (Portugal and others).

([1]) The maximum is to be considered as a saturation index. In the USA this index has been stable in recent years and a fall in the acreage under cereals has been accompanied by a reduction in the number of combine harvesters.

([2]) Projections of the growth of internal demand are thus of the order of 3-4 % over the periods shown.

More detailed study of the internal demand for self-propelled combine harvesters calls for consideration of a number of facts about the number of these machines on national territory.

The number of self-propelled combine harvesters in Italy (1) has increased considerably during recent years, the average rate of increase—as we have seen—being 27 % for the 1959-63 period, at the end of which there were 9 500 machines on the whole of the national territory. Relating this figure to the area on which these machines can be used, which is estimated at 3.2 million ha. under cereals (area under cereals on flat land, part of that on hilly land and none on mountainous is considered to be "combine-harvestable") we arrive at a ratio of 335 ha. per combine harvester.

The growth in the number of combine harvesters continued in 1964 at almost the same rate; it reached 12 254 units thus lowering the above mentioned ratio to about 260. It can be forecast that by 1965 there will be more than 14 000 combine harvesters.

The spread of these machines is the result not only of the generally rising level of mechanization that has been a feature of Italian agriculture in recent years but also of the need to replace less efficient machines whose use is becoming less and less economical for the holdings concerned. Threshing machines are a case in point. In Italy their numbers fell from 34 400 units in 1959 to 24 400 in 1963.

The greatest concentration of combine harvesters is in Northern Italy (see Table 4.1.8. - XXXI). But the growth rate recorded from 1959 to 1964 (27.4 % per annum) was of the same order in each of the major regions.

It is difficult to make a precise estimate of the ratio between "combine harvestable" area and number of machines per territorial region. However, if the ratio between all area under cereals and the number of combine harvesters is considered (it was about 1 800 for the whole of the national territory in 1959 and fell to about 500 in 1964) it can be seen that this figure is at its lowest in the North. The differences shown by the figures concerned exaggerate the facts, as can again be seen by taking the "combine harvestable" area which amounts to about half that under cereal, for the whole of the national territory but is a smaller percentage in the Centre and South than in the North.

Regarding the supply of combine harvesters in Italy it is estimated that in 1965 this will be around 4 200 machines, approximately half from home production and the rest from abroad. As regards home supply there are, at the moment, some ten plants all located in the North: but it is largely accounted for by the two largest Italian plants each of which has a production potential of over 1 000 machines a year. (the other units have outputs of a few machines per annum, proof of their "craft" character).

30 % of the sales of the largest producers go to the foreign countries already listed; sales on the home market are split between North Italy (2/3) and Centre and South (1/3).

Distributors' average selling price for medium capacity self-propelled combine harvesters (1 900-2 000 litres) is some 5.5 million lire; the free ex works price to distributors would be in the order of 4 million lire.

Combine harvesters are generally carried by road. Transport costs including packing from a works located in the industrial triangle to addresses in the Centre and North work out at an average of 70 000 lire per machine. In the South (mainland) the figure is 120 000 lire. Generally transport costs are charged to the purchaser.

Export selling prices outside the EEC seem to average about 3.6-3.7 million lire for the types concerned. This figure takes into account the export bonus and indirect tax refunds.

Moving now to forecasts of home demand, we have supposed that the number of combine harvesters in Italy will level off at 36 000 units in 1975, on the basis of a ratio of 90 ha. of "combine-harvestable" land per machine (2). This is on the assumption that the total area under cereals remains equal to today's figure, notwithstanding certain internal changes in crop distribution (less grain and more minor cereals) and that the corresponding "combine-harvestable" area also remains stationary, being delimited by physical features.

The average annual growth in numbers will slow down considerably as compared with the recent past, because it will be approaching the anticipated saturation level. Considering the major geographical areas the lowest increase will occur in the North where, as we have seen, combine harvesters have spread much further than in the Centre and the South. The relationship between the combine-harvestable area and number of machines in the three major areas in 1975 will be about 100 for the South and Centre and about 80 for the North.

The number of self-propelled combine harvesters in Italy in 1970 and 1975 is shown for the major areas in Table 4.1.8. - XXXII. Even accepting the validity of the development forecasts around 1975, it is obvious that the annual increase (and therefore the specific figure for 1970) can only be treated as a guide, the true figure depending on complex factors which may cause the rate to be different from that forecast.

(1) In Italy there are practically no types of trailed combine harvester, as found in other EEC countries.

(1) This ratio is higher than that postulated for the other member countries (67) because, as already noted, an appreciable part of the "combine-harvestable" area is hilly land.

The levels of home demand given in the table mentioned are obtained from the estimated increase in numbers together with replacement requirements (again assuming an average combine harvester life of about 10 years).

Internal demand for self-propelled combine harvesters should reach 5 000 units in 1970, showing an annual growth of 7 % on the 1965 basis; in the following years this growth rate will be lower and there will be some degree of saturation. Home demand will thus increase its absolute level in the five years 1965-70 by more than 1 400 machines and by a further 900 from 1970 to 1975.

In this latter period and in the following years the level of home demand should be largely maintained by replacement requirements, apart from the improvements in quality already referred to in the discussion of developments at Community level. These improvements, incidentally, are already in progress: in recent years an appreciable share of the replacement market is attributable to obsolescence caused by the better characteristics of the new combine harvesters on the market (better machines with a lower reject rate and less seed breakage etc.)

Bearing in mind the modest but by no means negligible level of exports and considering recent trends, we may forecast an annual growth of at least 5 % over the next ten years. As regards imports, if we assume changes in the structure of internal supply, these are likely to fall from the present exceptionally high level to a more moderate figure, around 1/4 of home demand in 1975.

If we accept these suppositions in forecasting home demand and foreign trade, national production of self-propelled combine harvesters should reach about 3 800 machines in 1970 and not quite 5 500 in 1975, thus increasing by about 1 750 units from 1965 to 1970 and a further 1 650 from 1970 to 1975.

The market for pick-up balers (fodder presses and straw-balers) (1) *in the EEC and in particular in Italy*

The available data for pick-up balers do not cover member countries' foreign trade (except Italy and France) but relate to production only. For the Community as a whole this has risen from about 38 500 machines in 1959 to something less than 60 000 in 1963, an annual growth rate of about 11 %.

The greatest increase in production was recorded in Italy where the rate was about 15 %, followed by France (13 %). For the Federal Republic of Germany the rate was 8 % and for the Benelux countries 9 %. Whereas France was a net exporter both in 1959 and 1963 (to a much smaller degree, for her exports had contracted considerably), Italy was a net importer.

Italian home demand was estimated at about 5 600 machines in 1963, an increase of more than 32 % per annum as compared with 1959. Total demand was somewhat higher (about 5 900 units) and similarly produced a slightly greater growth rate (about 34 %).

This increase in home demand was not matched by a corresponding expansion in production, which did nevertheless rise at a fairly high rate (15 %).

The consequence was a sharp increase in imports during the period (annual growth of 42 % between 1959 and 1963); exports, on the other hand, whilst showing a considerable relative increase, involved a very small number of machines which was still less than 100 up to 1962; only in 1963 did they reach a figure of about 300.

Italian imports of fodder presses and straw balers increased during the period from 1 160 machines in 1959 to 4 730 in 1963; in that year they came mainly (about 3/4 of the total) from EEC countries, largely from the Federal Republic (2 500), followed by France and the Netherlands (about 1 000 each). In this context it should be noted that the proportion of total imports represented by those from member countries has steadily increased (in 1959 they amounted to just less than half the total).

Exports, totalling 308 machines in 1963, went, for slightly more than half their number, to non-Community countries; there was also a small flow to the EEC countries from which Italy imports: the Netherlands and the Federal Republic.

Data on the number of pick-up balers in Italy are lacking. For the purposes of this report it has been estimated at about 24 000 units in 1963, 80 % in North Italy.

In 1965 an internal demand of 5 400 and exports of 460 machines are forecast. Imports, on the other hand, should fall to about 2 900 machines. National production should therefore touch 3 000 pick-up balers; this steep increase in production would therefore be largely based on the replacement of imports on a home market with demand remaining at the same level.

It is estimated that there will be about 29 500 pick-up balers in Italy in 1965.

Regarding present home supply sources, all producers—amounting to no more than a dozen—are located in the Centre and North. The three largest undertakings are thought to have a normal output of less than 1 000 machines each per annum. It should be noted that some producers combine the building of pick-up balers with that of other simpler agricultural machines.

(1) Here we refer to straw balers and fodder presses of the trailed type, whether driven from a tractor power take-off or by built-in engine (for baling).

The average distributor selling price for the machines in question is around 800-900 000 lire; the ex works price to distributors averages around 600 000 lire.

Road transport costs to distribution centres in the Italian market amount to about 2-3 % of the ex-works price to distributors, i.e. 12-18 000 lire per machine, including the packing of parts. Because of keen competition in the field of agricultural machines these shipment costs tend to be absorbed by the producers.

For exports to non-member countries, which earn bonuses and refunds (IGE indirect taxes) average fob prices, depending on the type of machine, are about 10 % less. Shipment and packing from works located in the industrial triangle to embarkation ports may cost an average of 12-14 000 lire per machine, but for works located near the ports this figure can be reckoned at about 8 000 lire.

In forecasting demand in Italy we may assume an increase in pick-up balers, associated mainly with the increase in fodder crops which should certainly take place in support of the development of animal farming that has often been urged at Community level and under national planning. It is clear that development of this sector depends on the possibility of reducing production costs of meat and other products, the demand for which is continuously growing.

Pick-up balers should also increase in numbers due to the need for further mechanization in cereal growing: here again the objective will be to reduce production costs which will assume particular importance as national grain prices fall with the application of Community agreements.

To sum up, the use of the machines in question should increase, particularly in all types of arable, livestock or livestock, arable farming, i.e. in the most widespread types of farm in Italy and also in zones that are mainly animal farming and those that are mainly cereal growing.

On the basis of the above considerations it is estimated that the number of pick-up balers in Italy will reach about 37 000 in 1970 and 42 000 in 1975. The growth rate from 1965 to 1975 is put at 4 %, bearing in mind that towards the end of the second five-year period signs of a certain degree of saturation will begin to appear, particularly in the North (see Table 4.1.8 - XXXIII).

It should also be pointed out here, as in the case of combine harvesters, that the annual increase in pick-up balers and the specific figures for 1970 and 1975 are in the nature of a guide. Today pick-up balers of the self-propelled type are beginning to be produced in Italy: an increase in these should also be expected. But it should be borne in mind that this type of machine offers little "competition" to the trailed type—with which the present report is more specifically concerned—for two main reasons. The first is that trailed pick-up balers are better suited to small and medium size holdings (which are, it will be recalled, in a large majority in Italy). The second is that, with the substantial number of tractors already in service, trailed pick-up balers help to make greater use of them, thus lowering depreciation costs. In practice, farmers (especially the small and medium) who already possess a tractor will prefer to buy the trailed type of pick-up baler, thus getting greater use out of their tractors rather than the self-propelled type.

Returning to the analysis of the market for trailed pick-up balers, home demand, based on the above forecast of increasing numbers together with replacement needs (assuming the average life of the machines in question to be about 9 years), should be about 5 000 units in 1970, a level about 7 % lower than for 1965, and about 5 600 units in 1975, practically, therefore, at the same level as in 1963. In 1970 this home demand will be largely represented by replacements, and even more so in 1975.

On the basis of recent trends it may be assumed that imports, at present at a high level (more than 50 % of home demand) will subsequently fall to 2 000 machines in 1970 and 1 200 (20 % of home demand) in 1975. Again based on recent trends, exports should increase to reach 800 machines in 1970 and 1 200 in 1975, with an annual growth of 9 %. Home production should amount to 3 900 pick-up balers in 1970 and about 5 600 in 1975.

The market for motor-cultivators, motor-mowers and motor-hoes in the EEC

The figures in Table 4.1.8.-XXXIV summarize recent trends in the EEC market for all three types of machine.

Internal demand in the EEC for the three machines taken as a whole has grown at a rate of about 9 % from 1959 to 1963; the greatest increase was in Italy, France and Belgium (growth rates of 10-11 %), with much lower rises in the Federal Republic of Germany and the Netherlands. In the same period production rose at a slightly higher rate (about 10 %).

Total demand—which, in absolute terms, is only a little above internal demand, reaching a figure of about 160 000 units—increased by practically the same number of machines as the latter, whilst trade with other countries showed a considerable increase in exports (8.7 % growth) and, conversely, a fall in imports (— 7.4 %) which, in 1963, concerned something less than 6 000 machines.

The figures show an increase in intra-Community trade at a rate of about 8.5 %.

Among the member countries only the Federal Republic had a net exporter situation at 17 000 machines in 1963, representing nearly 90 % of total internal Community trade. It should be noted that Italian exports had the greatest increase.

The market has, however, moved differently for each of the three machines in question. The scarcity (and/or absence) of data prevents an individual examination of each of the three: but on the basis of the information available—estimated in some cases—certain conclusions can be drawn concerning the motor cultivator market on its own (see Table 4.1.8 - XXXVI).

From the figures in Table 4.1.8 - XXXV it can be seen that the internal EEC demand for these machines increased between 1959 and 1963 at a rate of about 11 %, which is higher than that for motor-cultivators, motor mowers and motor hoes together. For motor-cultivators, trade with non-member countries shows trends that are the complete opposite of those for the three machines as a whole: whereas imports increased considerably in the four years 1959-63 (growth rate of 15 %) exports fell (at — 8 %). It should however be added that the absolute value of the flows in both directions was about equal in 1963, around 5 000 machines.

The trend of trade in motor-cultivators, the reverse of that of the other two machines in question, may be explained on the one hand (fall in exports) by increased production in other countries where, generally speaking, the number of these machines is on the increase and, in view of their success, efforts have been made to satisfy demand more from home production; on the other hand (increase in imports) it can be attributed to the emergence of a similarly growing demand in EEC member countries. However, Community production—considered as a whole—did not follow the same trend as demand (the production growth rate during 1959-63 was about 8 %).

Intra-Community trade in motor-cultivators—involving 80 % (about 16 000 units) of the total of the three machines concerned in this section—increased at practically twice the rate (16 %) of the three machines together (it is thus clear that trade in motor mowers and motor hoes diminished inside the EEC).

The positions of member countries regarding imports and exports of motor-cultivators are the same as those for the three machines as a whole. Whereas the Federal Republic of Germany appears as a net exporter, the level of imports for all the other countries exceeds that of exports: the smallest disparity between the two flows occurs in Italy's case, whose exports recorded by far the greatest increase (their absolute level, however, is small, reaching 400 machines in 1963).

Examination of the movements of home demand in individual member countries shows that the greatest increase over the 1959-63 period (a 30 % growth) was recorded in Belgium and Luxembourg; in these countries, however, the demand had the lowest absolute value (less than 3 000 machines); Italy is next, where home demand expanded at a growth rate of 21 %. Much lower rates (3 % - 5 %) are shown by the Netherlands and the Federal Republic, whilst France occupies an intermediate position.

Home demand figures for motor-cultivators are confirmed by those for changes in total numbers in use in the individual member countries.

In general it will be noted that motor-cultivators have everywhere been spreading rapidly in the recent past. The characteristics of these machines—principally their multi-purpose nature, small size and relatively low cost—favour their use especially in the small owner-managed holdings that form about half the agricultural holdings of the EEC. The number of motor-cultivators in the Community has grown from about 226 000 in 1959 to 340 000 in 1963, showing a total increase of more than 50 %, corresponding to an annual growth of about 11 % (see Table 4.1.8 - XXXVI).

Among member countries Italy showed the highest growth rate (about 40 %), far higher than that of other countries (second comes the Netherlands with an annual growth rate of 11.5 %), whilst the lowest is that of the Federal Republic (3 %).

It should be pointed out that—as Table 4.1.8 - XXVI shows—in the recent past (up to 1955) the two above-mentioned countries had the lowest (Italy) and the highest (Federal Republic) number of agricultural tractors in relation to arable acreage. This would therefore seem to bear out the theories held by many experts that motor-cultivators are found in greater numbers where there are fewer tractors; this is because, whereas the tractor is of limited use on small acreage farms—apart, obviously, from the financial resources of the farmer—the motor-cultivator, due to its characteristics, generally wins in borderline cases. This applies particularly to medium and high-powered tractors and less so with "mini-tractors" though even these involve a greater capital outlay.

As regards the future expansion of motor-cultivators in EEC countries a considerable general increase can unquestionably be forecast except for the Federal Republic of Germany, where, as we have already seen, there is already a high level of agricultural mechanization. But it is not easy to put a figure to this forecast expansion since it is not in fact possible to look for a correlation between motor-cultivator density and any specific feature of the agricultural sector as was possible, for example, with combine harvesters in relation to area under cereals; the motor-cultivator has, in fact, a wide range of uses for various operations with different crops.

However, in order to give some idea of motor-cultivator expansion in EEC countries it is possible to consider the number of holdings that are likely to constitute the most probably area of motor-cultivator usage. Such holdings may be considered to be those under owner-management which, on an approximate basis, may be defined as "small" and "medium" in the

present land system in the Community, i.e. having between 1 and 20 ha.; their number is about 3.1 million.

Assuming that in 1975 about one farm in every five of this category (and assuming no change in the total strength) will be using a motor-cultivator, this would give a total of about 600 000 machines for the whole of the EEC, showing a total increase of about 80 % over 1963, corresponding to an annual growth rate of 5 %. Based on 1965 the growth rate would be 4.4 %. The average assumptions for the EEC countries as a whole cannot however be taken as a basis for each individual country. Thus, based on the various growth rates of past trends which are assumed to continue, motor-cultivator strengths in EEC countries in 1975 may be estimated as follows:

	Units	*Growth rate 1963-75*
Belgium-Luxembourg	10 000	4.1
France	292 000	5.3
Federal Republic of Germany	120 000	1.7
Italy	160 000	9.3
Netherlands	30 000	1.5
EEC	612 000	5.0

If technical modifications are also considered, tending mainly towards smaller sizes of motor-cultivator, the forecasts made must be considered conservative, since further impetus would be given to the sale of these machines as has taken place in Japan for example.

The movements outlined above should be faster in the 1965-70 period and slower in the following five years 1970-75. It should however be noted that replacement requirements (assuming an average life of 8 years) from 1965 onwards would exceed those of the net increase in total numbers; this difference is likely to increase in the following years.

Taking these factors into account we may forecast an internal demand for motor-cultivators in the EEC of about 78 000 in 1970 and about 97 000 in 1975. In these figures the highest absolute increases are for France and Italy. As regards increases in home demand the highest (more than 7 %) would be in Italy, followed by France and the Federal Republic.

Regarding motor mowers and motor hoes, there are no data providing the basis for any reliable assessment of future trends. For the former machines, a reasonable expansion may be anticipated as a result of the development of the whole of the animal-farming sector mainly because of the future increase in demand for animal products, which has caused the competent Community authorities to adopt a policy of strengthening this sector—but it remains true that in most cases there is no information on the present density on which quantitative forecasts could be based (the only available statistics concern Italy and France). For motor mowers an expansion can also be forecast in the future but to what degree it is difficult to suggest.

It is certain on the one hand that the use of this machine, which in essence replaces the farmer's most traditional tool—the hoe—will spread, particularly in those areas where the general technical level of the sector is at its lowest. On the other hand the motor hoe will gain ground less easily in the more highly developed regions in particular and, in general, alongside the future spread of mechanization in the wider sense (but especially that of tractors and cultivating machinery).

However, in order to quantify in some way the development of the two machines concerned, it may be assumed, on the basis of estimates and forecasts that have been made (which, we would repeat, are, in this case, in the nature of very wide approximations) that internal demand in the whole of the EEC should increase over the next ten years at a growth rate of 2.5-3 %. For these machines, too, the replacement share of demand should be appreciably higher than that represented by increases in total numbers.

If these forecasts are realized—they may, incidentally, be considered conservative—there will be an absolute increase in the internal demand for motor mowers and motor hoes in the EEC of about 11 000 units between 1965 and 1970 and a further 16 000 during 1970-75. These increases would apply mainly to Italy and the Federal Republic of Germany.

The market for motor-cultivators, motor-mowers and motor-hoes in Italy

In the foregoing section it could be seen that in the recent past, the Italian market for motor-cultivators, motor-mowers and motor-hoes has had the greatest expansion of all countries in the EEC.

For all three machines as a whole, home and total demand both increased in the 1959-63 period at growth rates of 10 % and 13 % respectively. Production, which was not enough, to start with, to satisfy home demand, developed at a greater rate (14 %), so that in 1963 it exceeded home demand—though only by 500 units.

Foreign trade featured some increase in imports (especially from other EEC countries) but a particularly steep rise in exports which, from practically nothing in 1959, reached a total of 5 200 machines in 1963, 1 400 of which went to other EEC countries.

Motor-cultivators

In recent years motor cultivators have shown the greatest development, compared with other types of agricultural machine, climbing from just under 14 500 units in 1959 to more than 66 000 in 1964 (estimates for 1965 are 75 700), at an annual growth rate of more than 35 % (see Table 4.1.8 - XXXVII).

The rate of increase has been lower than the average in the North (34.1 %) and higher in the Centre and the South (40.6 % and 37.2 % respectively).

Present distribution of the machines in question by major areas shows that nearly 60 % of the total is concentrated in the North.

The greater relative increase in the Centre and South can be associated with the smaller number of other agricultural machines (particularly tractors) in these areas, compared with the North. Additionally the greater fractionation of agricultural holdings in the Centre and South would constitute in a certain sense a favourable factor for the use of motor-cultivators as opposed to tractors, which are larger and therefore not so well suited to farms of small acreage.

The above changes in the number of motor-cultivators are the basis of the vigorous increase in home demand for these machines which averaged a rate of more than 20 % per annum in the 1959-63 period.

Unlike the situation for the three machines as a whole, the level of motor-cultivator production in 1963 remained lower (by about 1 500 units) than that of home demand; consequently Italy appeared in that year as a net importer of these machines. Note should however be taken of the considerable increase in exports which rose from very few units in 1959 to about 1 500 machines in 1963, 400 of which went to EEC countries.

About 80 % of Italian imports came from the Federal Republic of Germany; more than 60 % of exports went to Mediterranean countries and the remainder to a variety of countries (not in the EEC).

It is estimated that Italian production of motor-cultivators will approach 15 000 machines in 1965. This considerable increase over 1963 should raise exports to a figure of 2 200 motor-cultivators, the remainder going to the home market. Home demand should reach 14 000 machines of which only 1 500 will be imported.

As regards home supplies, these come from some ten producers, almost exclusively located in the Centre and North. The largest producer has an output of 8 000 machines with a capacity which could reach 12 000.

Selling prices for each type, on a basis of equivalent characteristics and equipment, are roughly identical throughout the whole Italian market; in other words the varying transport costs do not affect the prices for shipment to different areas, being generally absorbed by the producers.

In detail, the distributor selling price on the Italian market of a motor-cultivator with the normal implements: disc plough, double share, harrow, will average around 400-430 000 lire; the ex-works price to these distributors would be 320-350 000 lire. Transport costs from works in the industrial triangle to addresses in the Centre and North would average 5-6 000 lire and for the South (mainland) about 9-11 000 lire per machine.

For exports to non-EEC countries, which earn bonuses and tax refunds (IGE), the corresponding prices for the type of machine concerned on an fob basis would be of the order of 300 000 lire including packing. Transport costs from works located in the industrial triangle to embarkation ports would average about 8-9 000 lire; for a works located near a port this would be 5-6 000 lire.

Passing now to forecasts of home demand for motor-cultivators, bearing in mind the foregoing considerations, we assume a far smaller increase in total numbers than in the past, amounting to an average annual growth of 7-8 % from 1965 to 1975, bringing the total to 160 000 machines at the end of the period. As compared with the assumption made for the whole of the EEC territory, i.e. a motor-cultivator density in 1975 of one for every five owner-managed farms of from 1 to 20 ha., the ratio would be slightly lower in Italy, equivalent to 1 machine for every 6 farms in this category (1). Among the major areas it is supposed that the North will have a very low increase with total numbers levelling off towards 1969-70, with much greater increases recorded in the Centre and the South.

On the basis of these estimated numbers, together with replacement needs (assuming an average life of about 8 years) the home demands shown in Table 4.1.8 - XXXVIII should be fulfilled in 1970 and 1975, i.e. 22 000 and 28 000 units respectively. This demand would be sustained mainly by replacements, particularly in Northern Italy where a moderate increase in total numbers is forecast.

If we also assume an increase in exports—following recent trends—mainly going to Mediterranean countries, at a rate of 10-15 %, accompanied by a further fall in imports to about 1 000 in 1975, national motor-cultivator production should then be around 35 000 units (25 500 in 1970 against 14 700 in 1965). Summing this up, Italian production of motor-cultivators could increase by about 11 000 machines in each of the next two five-year periods.

Motor-mowers

Production, home demand and foreign trade in motor-mowers in 1963 are shown in Table 4.1.8 - XL. In 1965 it is estimated that home demand should increase again to reach a level of 30 200 machines, that imports should remain practically stationary and that exports should show a modest increase moving up to a figure of 2.7-2.8 thousand machines. The total number of motor-mowers should reach 228 000 (208 000 in 1964).

In Italy motor mowers are concentrated in the Northern area where there were 90 % of the national

(1) According to the census, the number of such farms is 1.6 million, about 1 million of which may be considered to be on level or hilly ground on which the use of motor-cultivators is considered possible.

total in 1964. This is obviously to be associated with the large area under grass.

In recent years (1959-64) there has, however, been a much greater increase in the Centre and the South (at average annual growth rates of 71.7 % and 84.3 % respectively) than in the North (rate: 25.9 %) (see Table 4.1.8. - XXXIX).

It should be noted that the North is very close to saturation level in these machines as is shown by the number of hectares under temporary grass per motor-mower; the figure was 12.5 in 1963 and even lower—although it cannot be calculated owing to lack of precise information on the crops in question—in 1964. The equivalent ratio for the Centre and South is far higher (1).

In Italy some ten works located in the Centre and North are engaged in the production of motor-mowers. The largest Italian producer puts out about 15 000 machines per annum.

The average distributor selling price of a motor-mower of the type in question varies around 260 000 lire; the ex-works price to distributors would come to about 200-220 000 lire. The cost of shipment, generally absorbed by the producer, averages 5 000 lire for carriage from a works situated in the industrial triangle to distribution centres in the Centre and North and 8 000 lire approx. for the South (mainland). The average export price for the types concerned and on a fob basis, taking bonuses and IGE refunds into account, for sales to non-EEC countries would be in the neighbourhood of 180-200 000 lire.

Shipment costs, including packing, from these works to port of embarkation averages 8 000 lire; for works located near a port this cost falls to 5 000 lire.

Passing now to market forecasts, the number of motor mowers in Italy may be expected to increase, particularly in the South in association with the spread of grassland which will mainly occur in the large areas to be included in future irrigation systems in accordance with the plans of the Cassa per il Mezzogiorno (the Southern Italy Fund); in these regions the number of machines may also be expected to rise in relation to area under grass.

But in the North the increase in motor-mowers will be mainly determined by an extension of the grassland.

The rate of increase assumed for the 1965-75 period is 4 % for the whole of Italy and, at the end of the period, there should be a total of 311 000 motor-mowers. This is a substantially lower rate than in the recent past, because of the higher total in the North. In this major area, therefore, a very low increase is forecast whereas for the Centre and South much higher rates may be postulated.

The changes in numbers, together with replacement needs (assuming an average motor-mower life of about 9 years) suggest a level of home demand of about 37 000 units in 1970 and 46 000 in 1975 (see Table 4.1.8 - XL).

Taking into account a further slight increase in imports and, conversely, an increase in exports at a rate of less than 6 %, this would give a national production figure of about 37 000 for 1970 and more than 47 000 in 1975 with increases of more than 5 000 units in the first five-year period and about 9 500 in the next. Production growth rates would be 3.5 % in the periods shown.

Motor-hoes

The total number of motor-hoes in Italy has increased by about 10 times in only four years (1961-64), reaching 26 000 units approx. in 1964.

Geographical distribution over the national territory in 1961 and 1964 as estimated for the purposes of this report appears in Table 4.1.8 - XLI.

The same phenomenon has been observed for motor-hoes as for motor-cultivators, i.e. a relatively higher increase for the Centre and South areas, and lower for the North. The reasons may be considered to be similar to those set out on the subject of motor-cultivators, that is the difference in mechanization in general among the geographical areas and the predominance of small farms in the South.

It should however be noted that the rate of increase has been falling, relatively speaking, and has affected home demand. Whereas in 1963, with a total of about 18 000 motor-hoes, home demand was about 11 000, in 1965 it is estimated that, with a total that will reach 33 000 units by the end of the year, home demand will contract to only 7 000. Imports having remained stationary in recent years and limited absolute increases having taken place in exports, production (unless exports take a sharply favourable turn in the second half of that year) will fall to a level of about 8 000 motor-hoes (more than 25 % less than in 1963).

There are some works active in the national field, two of them of medium-small size located in the South. The largest Italian producers are three located in the Centre and North who have outputs of 1 000 machines each.

Looking to the future it may be stated that there will be a further increase in these machines in Italy but at a rate considerably lower than that observed in the recent past and that, among the geographical areas, the North will show the lowest increase.

What has already been said applies here again, i.e. that motor-hoes generally have a greater chance of adoption in those areas where there is a lower degree of mechanization, particularly with tractors and

(1) In this context it should be added that motor-mowers can also find partial use in other grassland apart from that under consideration (temporary grassland): e.g. for mowing parts of the permanent grassland.

ploughs. In this context, however, it should be remembered that there are small farms with highly intensive cultivation where the motor-hoe can be usefully employed alongside other machines. Particularly in the South this type of farm is going to increase in numbers as a result of the development and improvement of vast areas under the programmes of the "Cassa per il Mezzogiorno".

On the basis of average annual increases of the same order as those assumed for motor-cultivators (and generally lower than them) the number of motor-hoes in Italy in 1975 may be estimated at about 70 000 units.

The annual growth, based on 1965, would thus be 7.8 %.

Together with replacement needs, this reasonably-paced increase in numbers (assuming the average life of a motor-hoe as about ten years) would lead to a home demand of about 10 000 machines in 1970 and more than 12 000 in 1975 (see Table 4.1.8 - XLII). As a perusal of this table will show, home demand, although taken to be increasing between 1965 and 1975, would, in practice, only be roughly back to the 1963 figure in 1975 (over 10 000 units); and this despite an increase in numbers in use between 1965 and 1975 at a rate of almost 8 %.

Thus a stabilized production level can be forecast for the next ten years, even supposing an increase in exports of the order of 7 % per annum and in imports of 2 %. This is on the understanding that factors difficult to foresee do not intervene, such as a shift of demand among machines of similar type, the possibility of replacement accelerated by obsolescence, a much greater increase in exports, etc.

The anticipated market for the new unit and its size

The planned unit, like all the other heavy and medium mechanical engineering units forming the basic complex of the Bari-Taranto-Brindisi pole, is designed to be highly competitive.

In the first place it is supposed that the unit will necessarily be created by an organization that already commands wide technical, economic and commercial experience, possibly by linking a large Italian firm in the industry with an equally important German or Belgian company established on the international market.

In particular it should be noted that, in comparison with the major Italian producers, this unit, operating in the pole, will also be able to count on auxiliary and subsidiary units and will be able, moreover, to take advantage of units specialized in the production of gears and metal pressings not available at the moment even to the large units operating in the Centre and North.

What is more, the new unit would be the first in the agricultural machinery sector in Italy to feature new and more rationalized production principles aimed at standardization of the component parts of the various types of machine in the range produced, standardization in the design of tooling and standardization and grouping of blanks with particular reference to castings, etc., all of which will bring advantages comparable with those of mass production even though production lines may be smaller than those of some of the largest national, and especially foreign firms.

It must be stressed that the prototypes must originate from a very wide experience in the specific field of application of agricultural machines (prototypes tried out on various terrains, in various seasons, in different environmental conditions of use, etc.) and be characterized by sound design and solidity. But these characteristics must fit in with the above engineering processing requirements which must not fail to be taken into account at the design stage. The reconciliation of these processing requirements with those of a diversified demand imposed by the market will, in principle, be achieved, especially for groups of similar machines, by the manufacture of common basic parts and a relatively wide diversification of implements for the various agricultural uses.

Taking into account on the one hand the degree of competitivity of the planned unit and on the other the forecasts of Italian home demand, Community demand and trends in foreign trade analysed above when examining the markets for the individual types of machine, it may be anticipated that the unit will reach the "normal" annual level of sales in Italy and abroad shown below:

	Unit of measurement	Home market			Exports	Total production
		Total	Centre North	South		
Combine harvesters	Number	900	600	300	100	1 000
Pick-up balers	Number	800	550	250	200	1 000
Motor-cultivators	Number	3 600	1 900	1 700	470	4 070
— with normal equipment	Number	(2 600)	(1 300)	(1 300)	(300)	(2 900)
— with special equipment	Number	(1 000)	(600)	(400)	(170)	(1 170)
Motor-mowers	Number	4 000	3 400	600	500	4 500
Other agricultural machines	Tons	2 000	1 600	400	250	2 250

It should be noted that the share of production intended for export would average about 10 %, a considerably lower figure than the actual export possibilities of the unit in question, particularly to Mediterranean and other non-member countries.

Production for the home market has been worked out excluding, in principle, any capture of markets from existing competitors, and is based solely on the winning of increases forecast in the home demand.

For combine harvesters, for example, sales on the home market would only correspond to the increase in demand in the years 1969-71, a demand which, in the five years 1970-75, would be able to absorb an output equivalent to that in mind for the planned unit. Similar considerations could be adduced for pick-up balers when it is considered that the increases forecast by the market projections for the next five years will tend to be concentrated in the last years of that period and that in any case the increases in the five following years could additionally absorb twice the production foreseen for the unit. Similarly, sales of motor-cultivators and motor-mowers on the home market would correspond to the increase, or only a part of the increase, in home demand for these machines in the years 1969-71, whilst in the following years up to 1975 home demand should show further major increases.

It should be noted that the production of "other agricultural machines" (machines for rice planting and cultivation; haymaking and other machines of similar mechanical construction to that of combine harvesters and/or other specified products) also covers "ancillary lines" which may vary with the particular policies of the industrialist undertaking the project and may represent as much as 20 % of the total output of the unit.

Regarding the distribution of sales on the home market it must be realized that a works located in the industrial triangle would be at a general advantage over a works situated in the pole because of the regional composition of home demand (the present incidence of transport costs on the ex-works price averages about 2 % for large producers in the industrial triangle on sales in the Centre and North and 3 % for sales in the South (mainland). But the disadvantage for the pole unit would work out in practice at less than 1 % of the cost of production. Moreover this would be partially offset by the advantages that the pole unit would have for overseas sales (the present incidence of transport from works to port of embarkation is 2-4 %, whereas for a works located at the port itself this falls to 1-2 %).

It should finally be pointed out that in general the proposed levels of production are purely guides since the business and commercial policy of the enterprise undertaking the project may possibly alter the quantitative distribution shown for the different lines. This would be within reasonable limits imposed by the anticipated development of the market, and within which the organization of the unit will remain viable.

Unit V

MANUFACTURE OF METAL-REMOVING MACHINE TOOLS

The market in the EEC for metal-processing machine tools with particular reference to those based on metal removal

The production of and, in general the market for, metal-processing machine tools (1) form essential and complex aspects of the economy of industrialized countries. An analysis of the market for such machines at Community and Italian levels would call for a far more extensive exposition than that presented in these pages, particularly as the situation is constantly being changed by the emergence of new factors.

Apart from a brief reference to the machine tool market in general, this report concentrates on the market for metal-removing machine tools; it deals in particular with those of a general type such as centre lathes, milling and grinding machines, and specifically those used for processing parts of medium size.

In this context it should be borne in mind that the unit planned for the manufacture of machine tools forms one of the exceptions to the application of a basic criterion governing the selection of all the units to be created in the pole, viz. that of not requiring a high degree of specialization and skill from the labour force. As was discussed in 4.1.4 there are a number of reasons for this partial departure from the rule to create in the area a centre of high-grade engineering activity capable of being used as a labour training unit, which will contribute to the creation of more advanced machine tool construction activities in the future and possibly the development of precision engineering in the pole; to link up in various ways with the maintenance and service units for metal-removing machine tools that will have to be set up in the area; and to meet certain market requirements that have emerged from preliminary analyses, connected with production outputs of widespread interest to engineering industries in the South and in countries where the process of industrialization is in its infancy. These requirements will also continue to create some demand in already industrialized countries though it is clear that here the best prospects will be enjoyed by plants with combined automated units for large series pro-

(1) Metal-processing machine tools are those based on metal removal and metal forming, thus excluding electrical machinery (for joining, welding, etc.), assembly machinery and other miscellaneous machinery. Machine tools can be general, specific or combined units.

duction and by punched-tape programmed machines for medium and small series. (1)

Despite these valid arguments and not forgetting objective considerations concerning the difficulty of recruiting and/or training skilled labour in the pole, the planned unit should be designed to the smallest dimensions compatible with a production and sales structure capable of competing at Community level. The market analysis that follows has been made with specific reference to these objectives and conditions.

Table 4.1.8 - XLIII contains a summary of information on the market in the Community and member countries for metal-processing machine tools in general (based jointly on metal removal and forming) excluding spares, expressed in weight. The exclusion of spares is solely due to reasons of statistical comparability since the figures available for some countries include accessories while others do not. If we could count on full and proper information for the whole of the EEC it is obvious that it would have been useful to include spares and accessories in the analysis, i.e. equipment, devices and miscellaneous tools that may, depending on the case, be supplied with the machine or separately.

It must further be realized that dealing with machine tools wholly by weight fails to bring out the profound differences in characteristics and performance between the various types of machine, whose productivity, moreover, increases with weight. An analysis limited to weight underestimates the trends of the group under consideration. But this generalization is dictated by the lack of even fairly detailed production statistics in all the member countries, except for the Federal Republic of Germany and France. On the other hand it is felt that the data given in the table mentioned are sufficient to trace the general trends.

It should lastly be noted that, given the purposes of this report, the production figures listed systematically exclude "own production", not only of works engaged in the building of these machines but also of some large concerns with various engineering activities which themselves build a part of the machinery they need (in Italy for example a motor-vehicle group is reported to produce about 15 000 tons per annum for its own use, i.e. 14 % of the national total; in France another car firm produces some 5-6 000 tons, 10 % of the production in that country).

The machine tool market in the Community grew by about 10 % per annum over the period from 1959 to 1963. Internal demand rose at a rate of more than 11 % and the demand from abroad increased at a rate of 7 %. Regarding supply resources, Community production rose by only 9 % so that supplies from non-EEC countries increased at a rate of 18 %.

In 1963 the internal demand for machine tools in the EEC exceeded 380 000 tons and production 455 000 tons; exports to non-member countries had reached nearly 130 000 tons and imports 57 000 tons (2). In detail, the Federal Republic emerged as the premier machine tool producer in the Community contributing almost 60 % (272 000 tons) to the EEC total, Italy came second with 20 %, or 93 000 tons, followed by France with 65 000 tons. The Benelux countries contributed about 6 %.

Production growth rates in the individual countries show considerable differences during the period: Federal Republic of Germany 5 %; France 8 %; Italy 26 %; and the Benelux countries also had noteworthy growth rates. The Italian and Benelux rates reflect the efforts made by this sector of industry to meet home demand from the expanding engineering industries and to adapt to the new conditions of competition created by the Common Market, as well as to strengthen their sales abroad. In the case of Italy particularly, the high level of production (and of home demand), which exceeded that of France in 1963 (but was much lower in the previous years) cannot be considered as indicating advancement to a higher stage of industrialisation but as the expression of this effort to adapt. From the point of view of the productive structure in the sector this was partly thanks to a very large number of small works almost of the "craft" type springing up during the period and, from the product angle, to the different technological make-up of the entirety of machines built (and ordered) which is not apparent from the figures by weight. EEC imports came mainly (over 45 %) from EFTA countries (in the order: United Kingdom, Switzerland followed at a distance by Sweden and Austria), and from the USA (37 %), practically all the remainder coming from Eastern European countries (mainly Czechoslovakia). 38 % of exports to non-EEC countries went to EFTA countries (Switzerland, United Kingdom, etc.), 14 % went to Mediterranean countries (Spain, Yugoslavia, Egypt, Greece, etc.), 11 % to Asiatic countries (Japan, India, Pakistan, Iran, etc.), 10 % to Eastern European countries, 9 % to Latin American countries, 5 % to the USA and Canada and the remaining 13 % to the rest of the world (South Africa, Australia, etc.).

(1) In all of what follows the term combined-unit plant will be used conventionally to indicate special machinery for combined lathe work or milling drilling-bevelling-planning-slotting, etc.; external broaching; multiple precision boring; gear-cutting; grinding, etc. Automation factors include those relative to special equipment for loading the workpieces and for their automatic transfer from machine to machine as provided in the operation schedules. In line with the most modern techniques this equipment is tending to develop mainly on the basis of economic and rational criteria thus conditioning the future form of production machines whose traditional characteristics at the moment involve the building of complex and costly loaders and conveyors. Future production machines, predominantly in the form of production units will, among other features, be characterized by improved structural design and at the same time reduced weight.

(2) It should be noted that these figures do not include separate components.

Whereas trade with the rest of the world increased by 10 % over the period, intra-Community trade grew at a rate of 20 %, the Federal Republic of Germany being the principal country concerned.

Moving now to metal-removing machine tools (see Table 4.1.8 - XLIV) it will be noted immediately that in 1963 practically 2/3 of total production and internal EEC demand for machine tools was formed of this class of machinery, little more than a third being represented by forming machinery (in 1959 metal-removing machinery represented 59 % and forming machinery 41 %).

Whereas production and internal demand growth rates for all machine tools were 9 % and 11 % respectively during the period, the figures for metal-removing machine tools were 11 % and 14 %. The higher rate can be explained mainly in terms of internal EEC demand and specifically by the fact that during the period engineering sectors using mainly metal-removing machinery developed faster than other engineering sectors. This should not necessarily be considered to be a long-term trend. In fact the growing importance of mass production and new technologies will lead, among other things, to the increasing replacement of forged and cast parts by groups made up from sheet metal. In this context, it is significant that in the most highly industrialized member country, the Federal Republic of Germany, home demand for forming machinery has the highest proportion (43 % compared with an EEC average of 36 %; France has 36 % and Italy 26 %).

In absolute terms, production of metal-removing machine tools rose from 188 000 tons in 1959 to 287 000 tons in 1963 (excluding separate components). Imports doubled to reach a level of more than 43 000 tons, at a growth of 19 %. At the same time the total supply (internal and outside) increased during the period at a rate of 12 %. The increase in internal demand from 147 000 tons to 246 000 tons represented a growth rate of 14 % and the export demand showed a growth of 8 % reaching a level of almost 84 000 tons. It is interesting to see that 77 % of all EEC machine-tool imports concerned those based on metal removal; the proportion was 65 % for exports. The former percentage is related to the fact that a large share of the demand for metal-forming machines is satisfied from within the Community itself, mainly by the Federal Republic. The considerable weight (second percentage) represented by metal-removing machinery is to be explained by the absorption of more than half the EEC exports by countries that are not yet highly industrialized. (Exports going to non-EEC countries and the sources of EEC imports of metal-removing machines reflect in a general way those already given for machine tools as a whole).

Intra-Community trade in metal-removing machine tools also showed a steep increase, the annual growth being about 18 %. In this field also the only net exporter was Germany, with an excess of exports over imports of more than 27 000 tons in 1963. In intra-Community trade the Federal Republic supplied about 70 % of machine tools as a whole; 54 % of net exports were metal-removing machinery and the remaining 46 % forming machinery.

In the individual member countries the market for metal-removing machine tools developed at different rates. Home demand for these machines rose by about 5 % per annum in Germany, 10 % in France, 34 % in Italy and 11 % in Benelux.

Regarding production in the individual member countries, in 1963, 157 000 tons of this class of machine tool were built in the Federal Republic of Germany, 55 % of the EEC total, at a growth rate of 6 % over the period. Italy showed a level slightly less than half the German figure contributing about 1/4 of the Community total; its production increased at an annual rate of more than 25 %. France, in third position, produced 40 000 tons showing a growth rate of 10 %. The Benelux countries attained a total output of 15 000 tons. On Italy's position in comparison with that of France what has been said earlier when analysing machine tools in general also applies, bearing in mind particularly here the markedly higher demand for metal-removing machines in the former country (74 %) compared with the latter and in general with the EEC average (64 %). The fact that the growth rates in the major producer countries, except for Italy, show considerably greater increase in the metal-removing machinery field than in the metal-forming field during the period, is to be explained by the reasons and considerations already set out.

Turning now to the category including the machines nominated for the proposed unit, it has been estimated that Community production of centre lathes, milling and grinding machines represents 40 %, 22 % and 13 % respectively of the total of metal-removing machine tools; they thus total 75 %. It is considered that this percentage would be under 50 % of the metal-removing machine tools (limited to centre lathes, milling and grinding machines for processing the medium-size parts that would be the specific output of the works proposed).

Among EEC exports to non-member countries the latter types of machine went predominantly to the few countries that had already reached a certain stage of industrialization whilst they continued to be limited in number as regards the lower performance machines (e.g. non-automatic tool-changes and manual feed, for producing small-size and lower-grade parts) required by the many countries in early stages of industrialization. The growth rate in exports during the period, however, showed changes in the trend of demand in developing countries in favour of machine tools of relatively higher performance such as the types suggested for the planned works.

Regarding the largest producers of metal-removing machine tools it is worth underlining that the two biggest EEC works are located in the Federal Republic of Germany and France. If we include works that have outputs of 15 000 tons per annum and over, this gives 4 in the Community of which 3 are in the former country and 1 in the latter; there are two producers with outputs in the 10-14 000 ton range, one in each of the two countries mentioned. Lastly the Federal Republic has 6 works with outputs of 5-9 000 tons per annum. There are several dozen firms with outputs of 2-4 000 tons per annum operating in the various EEC countries. Disregarding the internal production of a well-known car firm, the largest Italian producers and the biggest firm in Belgium fall into this category.

An assessment of the structure of the largest works in the EEC by capacity cannot be limited to consideration of the annual tonnage produced. It must be borne in mind that in machine tool construction there is, for reasons of both supply and demand, a wide variety of types and a vast range of models in each, often exceeding the actual working requirements involved in the processing of the parts. Although the output of the largest works does not, obviously, cover all types, it is, however, very diversified. The result is that production in the EEC, whilst of considerable volume, does not include large series.

For works with outputs of a certain volume (2-4 000 tons per annum) there is a tendency among the most highly organized to reduce the number of types produced (selecting those for which there is the highest demand or in accordance with a certain specialization) in order to be able to introduce repetition conditions for the production of each type comparable with those of larger works. These works, according to *ad hoc* analyses made for this report, are within the limit, from the point of view of volume of output, to be able to offer serious competition to their larger rivals not only from the productive point of view (production equipment, research, experience, methods, etc.), but also as regards supplies, marketing (advertising, sales organization) and finance. This relatively low limit from the point of view of establishment costs is due, among other things, to insufficient standardization of the component parts of the machine-tool types (at the moment this is limited to engines, electrical equipment, pumps, etc. apart from conventional trade and standardized products).

Below this limit there are hundreds of medium-small and small firms which, apart from some that concentrate on highly specialized production, were able to form and operate mainly in the shelter of protective customs tariffs and favoured by a long period of high demand. In normal demand conditions and against the background of an effective Common Market some of these would become less and less competitive.

Forecasts of the internal EEC demand for metal-removing machine tools in the next ten years may be made both on the basis of overall trends and also for the individual member countries. It is reasonable to suppose that demand in the Community will grow at a rate of the order of 6-8 % to reach 350 000 tons in 1970 and exceed 500 000 tons in 1975. Taking into account the growth of trade with the rest of the world and that foreseen for internal demand, EEC production should increase by at least 150 000 tons in each of the two five year periods. (These tonnage levels and increases are expressed in terms of today's weights per unit; in view of definite trends towards lower weights at least as regards mass-production machinery the forecasts made may show a certain drop).

Regarding the internal demand for centre lathes, milling and grinding machines for processing medium-size parts, the increase in each of the two future five-year periods works out at about 50 000 tons, to which would have to be added the considerable increase in export demand. The internal demand for these machines should expand at a relatively lower rate than that for other metal-removing machinery and particularly combined-unit automatic plants whose use is growing continuously, because of the increasing number of industries engaged in large series production aimed at reducing manufacturing costs (reductions in process time and labour) and punched-tape controlled machines doing medium and small quantity repetition work (to limit the need for skilled operatives and effect economies in labour costs). On the other hand, as already noted, the demand from developing countries will evolve—at least during a certain phase in their industrialization—shifting from machines of lower productive performance to those under consideration at a quickening pace.

To conclude, the analysis of the Community market would suggest that the unit to be established in the area of the pole should, finally, have a capacity of at least 2-4 000 tons per annum and that, although certain possibilities exist on the home market, an appreciable share of its output should be exported to developing countries.

The market for metal-processing machine tools in Italy with special reference to centre lathes, milling and grinding machines for processing medium-size parts.

Between 1959 and 1963, the market for metal-processing machine tools expanded more in Italy than in any other EEC member country; the growth rate was 32 % compared with 10 % for the EEC (see Table 4.1.8 - XLIII). Home demand in Italy rose at a rate of 38 % and export demand at 17 %. Home supply, i.e. national production, though expanding considerably at a rate of 26 %, was incapable of satisfying the total demand; imports thus increased at a rate of more than 60 %.

In detail, excluding separate components, home demand in 1963 reached 115 000 tons of machine tools and production reached a level of 93 000 tons.

As already mentioned, the "miraculous" development of the Italian machine tool industry comprised not only the expansion of certain average size works but particularly the formation of a galaxy of small firms which, although operating on a semi-craft basis, were able to maintain their activity because of the level of demand, profiting by the protective customs tariffs and low labour costs. The exceptional rate of increase in home demand for machine tools, however, was not only due to orders for equipment required to meet the marked rise in consumption, but also to improve productive resources, a first symptom of the new positions being taken to meet the keener competition expected to arise with the achievement of the Common Market. Last, but not least, is the fact that, comparing the volume of home demand in Italy with that of other countries like the Federal Republic of Germany and France, for equal weight the machinery ordered and sold in Italy does not, as has already been said, match that of the other two countries in characteristics and productivity.

Exports of Italian machine tools in 1963 were over 26 000 tons a 1/4 of which, 7 000 tons, went to EEC countries (a half to France and the rest to the other member countries). Exports to non-EEC countries break down into the following percentages of total exports; EFTA 19 % (mainly Switzerland and the United Kingdom), Eastern European countries 16 %, Mediterranean countries 13 % (Spain, Yugoslavia, Greece, etc.), Latin America 8 %, USA and Canada 5 %, countries in other continents 14 %. Imports amounted to 42 % of home demand, accounting for about 48 000 tons, 51 % coming from EEC countries (mainly the Federal Republic of Germany), 22 % from the USA, 17 % from EFTA countries (mainly the United Kingdom) and 8 % from Eastern European countries (Czechoslovakia).

Metal-removing machine tools represented 74 % of total home demand and 80 % of total production. As can be seen from the tables, Italy differed from the Federal Republic and France, over the period 1959-63 in that home demand and production rose less rapidly for metal-removing machine tools than for metal-forming types. Despite the fact that in Italy development was greater in the engineering sectors that use mainly metal-removing machinery, this movement was outstripped by changes in the productive structure of engineering industries in general which led to an increasing use of metal-forming machinery. This change in structure was destined to continue in the following years by processes of technological adaptation and trends towards series production approaching the levels of industrially more advanced member countries ([1]).

([1]) As we have already seen the home demand for metal-forming machinery in the German Federal Republic and in France in 1963 accounted for 43 % and 36 % respectively of the machine tool total.

The overall figures for metal-removing machine tools for the Italian market, excluding separate components, give a home demand of about 85 000 tons in 1963, production of 74 000 tons, exports of 21 000 tons, slightly more than 2 000 of which went to EEC countries, and 32 000 tons of imports, 14 000 tons of which came from other member countries (the distribution of these as regards countries of origin and destination for inter-Community trade and that with the rest of the world, correspond roughly to that already stated for machine tools in general).

Since the appropriate information is available for Italy, it will be useful for the purposes of this report to return at this stage to the analysis of machine tools in general, including separate components, in view of their importance for home production and demand. The 1963-65 figures are shown in Table 4.1.8 - XLV.

In 1963 the Italian market reached its maximum level. Machine tool production in that year topped 100 000 tons, imports came to 50 000 tons against an export figure of 27 000 tons; taking into account an increase in stocks of about 3 000 tons, home demand touched 120 000 tons. In the subsequent recession, the machine tool industry was one of the hardest hit sectors. Home demand fell steeply in 1964 and, according to the forecasts, persisted in 1965 at a level almost 45 % lower than that of 1963, i.e. 67 000 tons. By virtue of a drastic reduction in imports to 12 000 tons and vigorous efforts to increase exports to 33 000 tons, the cut in productive activity is said to have been less than 20 %, maintaining a level of 80 000 tons, despite having cut down a considerable part (8 000 tons) of the high stocks accumulated in 1964.

In the case of metal-removing machinery the decline in home demand was only slightly less than that of the total (43 %) falling from 90 000 tons in 1963 to 52 000 tons in 1965. In fact, whilst "replacement" demand in 1965 was maintained "new" demand fell by more than 56 %. Production falling from 80 000 tons to 64 000 tons, however, reflected the general trend of the sector taking a similar course to that described above in foreign trade and in changes in stock levels.

The greatest impact of the recession fell on centre lathes, milling and grinding machines for processing medium-size parts (see Table 5.2.5 - V, years 1963 and 1965). Home demand shrank by a good 57 %; from 53 to 30 000 tons; and production fell by 53 % from about 56 to little more than 29 000 tons. This is explained by the fact that Italian imports of these machines have been insignificant in recent years (400 tons in 1963), home demand having been covered by home production so that no replacement of imports was possible in part compensation; moreover, although exports of these machines show the highest growth rates among those for metal-removal, their absolute level is still of only slight importance in relation to production levels. Unquestionably if there were no grounds for optimistic forecasts for the next two five-year periods the study of the planned unit would

certainly not have been undertaken on the basis of the present situation in this sector in Italy.

Before passing to forecasts of total demand it would be helpful to re-examine the present structure of national production resources for metal-removing machine tools. In Italy there are more than 300 producers of these machines, the great majority being of small capacity and many being, in fact, in the nature of craft undertakings. As has already been pointed out, these were formed and operated in a period of excess demand, in which protective customs tariffs and relatively low labour costs were features. Not more than a score can be considered to be organized on a truly industrial scale and only about ten have outputs of more than 1 000 tons per annum. Of these the two largest make 3 500 tons and four others 2-2 500 tons per annum.

None of these works is located in the South (two units that are there must be considered of medium-small capacity).

Apart from the works referred to above and a few others that are highly specialized, the degree of competitivity of producers on a European and international scale is very low. For the other units, particularly those with very limited outputs, even with concentration of their activities on a restricted number of types and the use of more suitable production equipment the future appears somewhat precarious.

Among the largest Italian producers the maximum output for a single works of the products the planned unit is to produce are estimated to be the following: centre lathes and milling machines for processing medium size parts 250 tons per annum for each of the two types of machine; grinding machines 500 tons per annum. But in these works general, short-run production equipment is used.

Machine tools are distributed through representatives; there are practically no stocks held away from the works except for display at the agencies and this is limited to small machines.

Selling prices of metal-removing machines on the home market are, in general, the same throughout the country. Ex-works prices, on average, are at list less some 10 % to cover discounts and commission. Costs of shipment—normally by road—and packing are almost always, except for certain large and complex types of machinery, absorbed by the producers; the same is true of expenses involved in commissioning work carried out by staff of the manufacturing firm.

As regards machines of the type to be produced by the planned unit, the average list price should vary between 1 700 and 2 000 lire per kg, depending on the various types and models; the average net ex-works price would thus be 1 500-1 800 lire per kg. Since adjustment on site is not necessary for the types of machine in view, the corresponding costs would not occur (only the normal service and similar expenses). But the cost of shipment, as we have said, appears to fall on the producer: for shipment by road from a works in the Milan area to Centre and North zones this would be 13 lire per kg, and to districts in the South (mainland) 19 lire per kg. Packing costs which are limited to anchor blocks and cases for separate components, etc. should be less than 2 lire per kg. of machinery (1).

For overseas sales, thanks to the export bonus and the IGE refund, the average fob price for the machines concerned is 1 550-1 850 lire per kg. Shipment from the Milan area to embarkation port, free on board, is about 17 lire per kg; for a works situated near to the port this would be 11 lire per kg. For overseas exports packing, consisting of a wooden crate, would cost 30 lire per kg. of machinery. In effect the average incidence of transport costs is a little more than 1 % on home sales and less than 3 % on export sales.

Projections of demand and supply in Italy into 1970 and 1975 have been worked out firstly for all metal-removing machine tools and then separately for the types to be produced by the planned unit.

For metal-removing machine tools in general forecasts of home demand are based on the expected growth of replacement demand and "new" demand (net investment). The former takes account of a retrospective sequence of sales in earlier years and the average life of these machines which, for the purposes of the present report is taken to be 12 years—far below the real future requirements of engineering industries spurred by technological innovation and competition. The "new" demand has been estimated on the assumption of a recovery in the mechanical engineering industries by 1966; starting from a basic level of net investment in these capital goods a full 35 % below the corresponding figure for 1963 (47 000 tons compared with 73 000 tons) we assume a rate of increase in these net investments in machinery of 6.5 % per annum by 1970 and 7 % by 1975. These growth rates practically coincide with the forecasts we have given for the development of mechanical engineering as a whole for, although they would work out slightly higher on the basis of statistico-analytical calculations, they have been reduced by appropriate adjustment to take into account the rising average productivity-weight coefficient for machine tools resulting from changes in the make-up of demand by types (greater use of specific machining plant, etc., see above).

As can be seen from Table 4.1.8 - XLVI home demand should rise to about 74 000 tons of metal-removing machine tools in 1970, practically reaching the 1963 level, even allowing for the virtual doubling

(1) On the Italian market the cost of rail freight is higher than road transport for small and medium and equal for long distances. This is because, although the special rail tarifs reduce the cost of transport properly so-called, special, more costly, packing is required: 10 lire per kg as against 2 lire per kg.

of replacement demand by 1970. (The annual growth rates for "new" demand shown in the Table for the 1965-70 period appear high only in relation to 1965, a poor year, and not in relation to 1966, which has been used as the base year). Not until 1975 would home demand exceed 156 000 tons as a result both of a substantial requirement for net investment ("new" demand) and of a further increase in replacement demand which would also reflect the purchases made during the first long period of big expansion in the engineering sectors.

The distribution between Centre-North and South shown in the table takes these factors into account and also the logical effects of a continued policy of industrialization in the South which would be strengthened by a replacement demand of significant volume, particularly in the second five-year period.

Assuming an increase in exports at a rate of 6 %, much lower than past and recent trends, and an appreciable increase in imports compared with 1965 to cover 20 % of home demand in 1975 (38 % in 1963), there would be an output of 110 000 tons of metal-removing machine tools by 1970 and more than 173 000 tons in 1975 showing an increase of 46 000 in the first five-year period and more than 63 000 in the second. Compared with 1965 this growth in production would be equivalent to growth rates of the order of 11 and 10 % respectively. At all events, in relation to the 1963 peak, the industry making these machine tools should have increased its output by at least 30 000 tons by 1970.

Despite the unquestionable difficulties of this sector at the present, the facts emerging from the analysis show that a recovery in the activity of the mechanical engineering sectors, even at considerably reduced rates of development compared with those in the years of the economic "miracle" can offer positive prospects for the machine-tool industry in the near future and great possibilities in the 1970's.

What has been said applies to the future facing the metal-removing machine tool market in general. But that of the various types of machine and therefore of those machines that specifically concern the planned unit will not necessarily be the same.

First it must be borne in mind that normally the Italian demand for metal-removing machine tools (excluding "own production" in some large industrial groups) is made up of: combined-unit plant and other special machines 10 %, lathes 55 %, milling machines 25 %, grinding machines 6 % and other machines 4 %. For centre lathes, milling and grinding machines for processing medium size parts the corresponding percentages are estimated at 38 %, 19 % and 3 % making a total of 60 %.

It is to be anticipated that the growing importance of mass production in the majority of engineering industries and the consequent changes in production conditions will progressively increase the part played by combined-unit plant and special machines in general to a level of at least around 25 % by 1975.

Conversely, the share of centre lathes, milling and grinding machines of the types considered for the planned unit will tend to fall about 45 % of the nonetheless increased total sales of metal-removing machine tools at that time (centre lathes 29 %, milling machines 13 %, and grinding machines remaining practically unchanged at 3 %).

Simplifying what will, in reality, be a progressive and complex reorganization of production equipment, it can be expected that the use of centre lathes will decrease, being replaced by turret, capstan, automatic and programme-controlled lathes and that milling machines and column and sensitive radial drilling machines will decline in favour of combined-unit plants. It should however be stressed that in the foreseeable future the use of centre lathes and milling machines for making medium-size parts, together with grinding machines, ought not to fall below 40 % of home demand. This is because grinding machines will be used increasingly due to a rise in the output of quality products, while the other two types of machine will continue to form the basic machines in auxiliary units (including the numerous engineering repair workshops) and in certain subsidiary units and also remain in use in main units for non-repetition work, small-batch parts for making up non-repetition products, for purposes of internal maintenance and for experimental requirements (building prototypes, etc.)

It is, however, important to note that in the type of machine under consideration for the planned unit, i.e. centre lathes, milling and grinding machines (and other general machines such as boring machines, radial drills, planing machines, etc.) the trend, where they are required for medium and small quantity repetition work, is for types fitted with equipment for punched tape programme control to be more and more in demand.

On the basis of these forecasts (see Table 4.1.8 - XLVII), home demand for centre lathes, milling and grinding machines for medium-size parts should be 50 000 tons in 1970 and 70 000 tons in 1975 (54 % and 45 % respectively of the total home demand for metal-removing machine tools in those years).

The demand for production equipment in the engineering industries as a whole will not change at the same rate in the Centre and North as in the South. Demand for the types of machine concerned which is normally relatively higher in the southern areas, compared with the Centre and North because of the structure of the industries there, will become about 26 % in 1975 (21 % for metal-removing machine tools in general). This is due not so much to any slow-down in the process of modernization as to the creation during the period of the vast co-ordinated industrial pattern of auxiliary and subsidiary units. In the southern areas in fact demand for these machines

is expected to reach 12 000 tons in 1970 and will be at least 18 000 in 1975 with increases of some 4-6 000 tons in each of next two five-year periods.

Regarding export forecasts for this type of machine (which may be considered as production equipment applicable somewhere between infant industries and those of a certain importance) it is anticipated, from the trend of demand from countries that are now developing, that exports will tend to increase at about double the rate given above for all metal-removing machine tools. Rates of the order of 12 % are possible for the particular types concerned having regard to the present extremely low level of Italian exports in this field and the opportunities for Italian products to strengthen their position on the market in many developing countries. In reality the possibilities of increasing Italian overseas exports would be much better if costs were lowered for unchanged or improved product quality, if the strongest existing concerns extended their sales organization and above all if export credit were stepped up.

To sum up, Italian production of centre lathes, milling and grinding machines for medium-size parts, including separate components should, at the lowest, reach the 1963 level in 1970 and exceed it by 25 000 tons in 1975.

The anticipated market for the new unit and its size

Having regard to supply and demand trends on the market and the degree of competitivity to be achieved, the new unit could be designed for an annual output of 3 000 tons of machine tools broken down as follows:

(in tons)

	Home market			Exports	Total production
	Total	Centre North	South		
Centre lathes	1 250	620	630	660	1 910
Milling machines	550	230	320	330	880
Grinding machines	150	100	50	60	210
Totals	1 950	950	1 000	1 050	3 000

The production and sales figures given above refer to the machines concerned limited to the types used for processing medium-size parts. Centre lathe production would be spread over 7 types covering 21 models (3 models per type), that of milling machines over 5 types covering 5 models and grinding machines, 4 types covering 8 models. About 7-8 % of the outputs shown would concern spares.

The levels of production shown would thus place the works with today's two largest Italian producers of machine tools. With these production outputs, the design criteria on which the planned unit would be based, the structure of the pole where it would be located which would include, among other intermediary units, subsidiary gear-cutting units for highly specialized repetition work, and the effect of subsequent incentives, the plant would find itself in a position of advantage over the majority of existing units. It should be stressed that the possibility of obtaining gears from a subsidiary works specially equipped for this type of output is of considerable advantage for the economic size of the planned works compared with the majority of units in the Centre and North which, for the same volume of production, must be able, with their own internal production equipment—not always in full use—to manufacture the appreciable percentage of components represented by gears, keyed shafts, sliding bushes, etc, particularly in the production of machine tools.

The production level of the planned unit, in relation to Italian production of these particular types of machine, would represent 4-5 % of the total in 1970. It has been seen that the Italian output of these machines in 1970 would exceed the peaks recorded in 1963 and then continue to increase at a growth rate of 8 % in the following years; in the five-year period in which the unit would go into full production, this would involve annual increments of the order of 4-5 000 tons. The creation of the planned unit would therefore absorb a percentage less than a single year's increase in production.

Regarding the distribution of sales by markets, the unit should be able to sell at least 35 % of its output abroad in overseas countries. For reasons analysed in earlier pages the possibilities offered by external demand suggest that this sales proportion will be exceeded.

On the home market 50 % of sales could be placed in the South. This forecast is also conservative since the unit would only be satisfying 6-8 % of the anticipated demand from the South in the 1970-75 five-year period and the planned works, apart from price and quality, would also have in its favour the fact that it would be the only large unit in activity in those areas and purchases by local buyers would entitle them to higher grants from the Cassa (1) under the laws in force in relation to the South.

The percentage of sales that the unit would achieve in the Centre and North in 1970-75 would form about 2 % of the total annual demand in those areas. For one of the largest works of its type in Italy and bear-

(1) Grants are made for the construction of new industrial plant and the enlargement of existing plant of up to a maximum of 20 % of the cost for machinery and other capital assets specified in the Act. These grants may be increased to 30 % for expenditure on machines and other equipment constructed by industries located in areas in the South.

ing in mind that the incidence of transport costs for the machines concerned is very small (1.3 % of the ex-works price for sales in the Centre and North and 0.9 % for sales in the South), this figure could not be more modest. The sales figure suggested for the works would, in any case, represent less than half the annual increase in demand for the Centre and North areas in the five-year period.

Finally, bearing in mind future prospects of both Italian and Community internal demand, it is far from unthinkable that after at least five years of full activity the planned unit will be able to enjoy growing demand margins by virtue of new output lines, extending its production range to include special machinery and reserving a part of the capacity of its production machinery, for example, to the building of machine units with multi-tool heads.

Unit VI

MANUFACTURE OF EXCAVATORS, LOADERS AND MOBILE CRANES

The market for excavators, earth-moving equipment and boring machines in the EEC

The available statistics are inadequate for a quantitative examination and breakdown of the specific markets in the EEC for excavators, loaders, bulldozers, angledozers, motor-graders, motor-scrapers, dumper trucks etc., because no individual production figures exist for each of these items in any EEC country. Despite a number of attempts to obtain such figures from national manufacturers' associations and other sources, no positive results have been forthcoming (only in Italy was it possible to carry out a survey of the most important manufacturers in the field; the results are analysed later on). It was therefore necessary to start with overall figures and market analyses for excavators and earth-moving equipment, and then include other machinery, e.g. for road building and soil boring, etc. (1) for the sake of statistical comparability.

Even in the context of an overall examination, it was necessary to resort to estimates (especially as regards production) for Italy and Benelux (where the statistics include figures for other machines used on civil engineering sites and in the manufacture of certain building materials); in the case of the Federal Republic of Germany, adjustments were necessary because the statistics included tunnelling and mining machinery. Estimates and adjustments also had to be made as regards foreign trade in some countries (1959 figures).

Where possible, temporary exports and imports and re-imports and re-exports of the machinery in question have been excluded from foreign trade figures. However, temporary exports of machinery by national firms working abroad are not always recorded in the final export figures when such machinery is sold locally on completion of the works. In certain member countries, notably Italy, substantial purchases abroad are concealed in the machinery re-importation figures.

Finally, an analysis of output and foreign trade based on tonnage alone is bound to introduce an element of distortion, owing to the considerable variation in value per unit weight of the various machines covered by this study. On the other hand, the use of price figures would have presented difficulties in conversion to a common unit of account and difficult problems of deflation (2). The above limitations mean that the figures and results deducible from Table 4.1.8 - XLVIII are simply general indications of the market in the EEC and its member countries for excavators and earth-moving and boring machinery. Within these limitations, however, it is considered that these figures and results are useful for a general evaluation at Community level.

The market for excavators and earth-moving and boring equipment in the EEC grew at an average annual rate of 15 % between 1959 and 1963. Internal demand grew at a rate of 16 % and external demand at some 11 %. Production did not rise as fast as overall demand although the rate of growth was 13 %; consequently, the balance of internal Community demand had to be made up by a sharp increase in imports, which rose by 33 % over the period in question.

Internal demand in the EEC rose from 310 000 metric tons in 1959 to 558 000 in 1963. In the individual member countries, rates were comparable with that of the Community as a whole. During this period, output in the EEC rose from 324 to over 530 000 metric tons. In 1963, the largest manufacturing member country was the Federal Republic of Germany with about half the entire EEC output (rate of increase 13 %), followed by France with over 1/4 (rate of increase 12 %) and Italy with less than 1/5 (rate of increase 17 %).

In 1963, exports from the EEC to countries outside the Community amounted to over 63 000 metric tons, equal to 12 % of the Community's output. 37 % of such sales to non-member countries went to EFTA countries (Switzerland, Austria, United Kingdom, etc., in that order), 27 % to the Mediterranean basin (mainly Spain, Greece, Algeria, Turkey), 9 % to various African countries, 6 % to Eastern Europe, 9 % to Asia, 6 % to Latin America and the remainder to other parts of the world. Imports to the EEC amounted to about 90 000 metric tons, equal to 16 %

(1) If we were to study the market for the above machinery separately in each one of a number of countries, there could be a significantly smaller degree of aggregation, with considerable detail in the foreign trade sector only.

(2) To express the figures for the years being compared in terms of constant prices, it would have been necessary to introduce a large number of prices which would have been very complicated to determine as a result of the multitude of types of machinery concerned.

of internal demand. The countries of origin of the imports were the USA with 54 % and the EFTA countries, mainly the United Kingdom.

Trade in this machinery between member countries of the EEC amounted to 42 000 metric tons in 1963, having grown much faster than trade with the rest of the world—33 % rate of increase as against 11 %. The Federal Republic and France had a surplus of exports on trade in these products within the Community; the other countries imported more than they exported.

Output and demand in the EEC continued to rise in 1964 and 1965, although at lower rates than in 1959-63. Expansion of the market was slower not only in Italy, which suffered a recession, but also in the other member countries (except the Federal Republic).

Over the next 10 years internal demand in the EEC as a whole, and for all the machinery in question, may be expected to rise at an annual rate of at least 8 %, according to forecasts for the consumer sectors (quarries, mines, civil engineering, miscellaneous industries, etc.). Allowing for a further increase in net exports, EEC output should exceed 900 000 metric tons in 1970 and 1.3 million metric tons in 1975. During the next five years, Community output of excavators and earth-moving and boring machinery should rise by at least 300 000 metric tons as compared with the present level, and by a further 400 000 metric tons in the following five years.

In view of the quantities of such machines required by the various users, it appears that much of the increase in overall demand in the next 10 years will be accounted for by excavators and loaders, especially hydraulic and rubber-tyred loaders. In the excavator sector, France and the Federal Republic have a number of factories turning out over 15 000 metric tons per year, and these are the largest manufacturers in the EEC. In the loader sector, the most important producers are in Italy and the Federal Republic, with normal annual outputs exceeding 20 000 metric tons (this figure may include, as in the case of Italy, the complete propulsion units, supplied by the automotive industry).

Technical and economic studies carried out especially for the purposes of this report show that a new factory with a capacity of 15-20 000 metric tons per year would be one of the leading European manufacturers as regards production equipment, processes, organization and methods, studywork and design, supplies, sales organization etc.; its basic products would be excavators and loaders and it would also produce other earth-moving and similar machines; it would also manufacture propulsion units (except engines), not only for the excavators, but also for certain types of loaders and other self-propelled equipment. The factory planned for the pole will have to be on such a scale if it is to operate competitively on the EEC and general international markets.

The market for excavators and earth-moving and boring machinery in Italy, with special reference to excavators, loaders and similar machinery

In the period 1959-63, the Italian market for these machines (see Table 4.1.8 - XLVIII) grew at an average annual rate of over 20 %. Internal demand expanded by some 18 % per year; in 1963 it exceeded 100 000 metric tons, practically double the figure for 1959. External demand on the Italian market had quadrupled; negligible in 1959, it rose to over 16 000 metric tons in 1963. During this period, internal supply, i.e. national output, made a great effort to match the demand. The productive sectors concerned raised their output by 17 %, one of the highest rates achieved in the EEC production increasing from 49 000 metric tons in 1959 to 92 000 in 1963.

In particular, in 1963, Italian exports accounted for about 17 % of EEC exports to non-member countries. About 27 % of Italian sales abroad went to member countries (over 4/5 to France and the Federal Republic of Germany and less than 1/5 to Benelux), 20 % to EFTA countries (especially Switzerland and the United Kingdom), 26 % to countries in the Mediterranean basin (Turkey, Spain, Egypt, Yugoslavia, Libya, Tunisia and others, in that order), 3 % to various African countries, 6 % to Asian countries, 3 % to Latin America, about 11 % to E. Europe and the remaining 4 % to other countries (1). Of the total imports, about 22 % came from other member countries (France and the Federal Republic), over 30 % from EFTA countries (practically all from the United Kingdom), about 40 % from the USA, and the remaining 8 % from other countries (including over 5 % from Japan).

Analysis of the relevant production and demand figures reveals two broad groups: machinery for excavation and earth-moving and drilling machinery and accessories (these two groups account for over 95 % of the total). The second group—drilling machinery, other than for oil and gas—comprises a rather small sector in Italy, which is not growing. Drilling machinery for oil and methane gas is largely produced for ENI and the sector is dominated by firms with State holdings. Consequently, it is considered best to exclude these activities from a new large mechanical engineering unit in the Bari/Taranto pole and to turn primarily to the machines in the first group, for which there has, at least in recent years, been significant growth in both demand and output (see Table 4.1.8. - XLIX).

The above Table shows that in the period 1959-63, the market for excavators and earth-moving plant, which accounts for nearly 2/3 of the total in the

(1) These figures (for the distribution by countries of exports in 1963) should be taken as rough indications only, as it was not always possible to identify and allow for temporary exports.

sector with which we are concerned, grew by about one third every year. Internal demand rose at a rate of 30 % and sales abroad by nearly 50 %. Despite annual output growth rates of 40 % to meet part of the domestic demand, imports rose by nearly 17 %.

In the above group the following machines predominated in 1963: loaders, bulldozers and angledozers (including rippers) and excavators. The output of and demand for motor graders, scrapers and dumpers, on the other hand, was low.

Only 50 motor graders were produced, and the production of motor scrapers was virtually non-existent. Only 60 large dumpers (18-22 metric tons capacity) were built, whereas production of small dumpers (1 cu m capacity) amounted to 1 700 units. The limited use in Italy of motor graders and scrapers and large dumpers is probably due to the particular foibles of road-builders and other civil engineering contractors. There are unlikely to be any substantial changes in the use of these machines in the next 5-10 years unless road building techniques are rationalized and certain other requirements are met. There may, however, be an increase in the use of, and hence in the demand for, dumpers, which, if they follow the same trends as loaders (1), should gradually replace lorries in earth-moving during the next ten years. Ordinary lorries will no longer be suitable for such loads, as loaders, with their larger bucket capacities, will cause contractors to use dumpers with capacities of 20 or more metric tons.

As for bulldozers and angledozers, although the extraordinary growth in demand and production between 1959 and 1963 is a fact, they do not appear to have prospects sufficient to justify their inclusion amongst the machinery to be built at the new unit in the pole. In the case of bulldozers, etc., output in Italy rose from 400 units in 1959 to 1 400 in 1963. During the 1964-65 recession, output remained at about 1 500, although there was a considerable accumulation of stocks. As regards the prospects for dozer demand, improved road-building techniques, etc., will come into use, so that heavier digging machinery than that at present available will be necessary. Production of bulldozers and angledozers may therefore fall slightly rather than rise, but this will be counterbalanced by growth in the grader, scraper and large dumper sectors.

To summarize, although there is no doubt that in principle excavators and earth-moving machinery will be used not only for road building but also for civil engineering projects (airports, dams, land reclamation, hill reservoirs, building, etc., quarries and other industries), the group consisting of dozers and motor graders and scrapers will be used primarily in the road building sector (2). The number of machines of this type in use, and hence the demand and output, will depend primarily on this sector. Despite the importance of the road and motorway programmes, the rate of growth in site activities is unlikely to exceed 2 % per year, which is much less than the anticipated rate for the other sectors using digging and earth-moving machinery in general.

For all the above reasons, it is felt best to concentrate our analysis of the market on loaders and excavators. Since large mobile cranes have similar structural parts and a certain number of similar mechanical parts to these machines, a special study of the market for this product has been made, in order to increase the size of the factory and make better use of certain equipment. For similar reasons, and without further analysis, it is felt that large dumpers can also be included, as secondary products.

The excavator market in Italy

From 1959 to 1963 the market for excavators grew at a rate of almost 12 % (in terms of numbers), for overall supply and demand (see Table 4.1.8.-L); this rate is 17 % in terms of weight (see Table 4.1.8.-XLIX).

Internal demand rose from 290 excavators in 1959 to 455 in 1963 (growth rate 12 % by numbers, 18 % by weight). Apart from replacement demand, this represented increased requirements for mining and quarrying, for the extraction of limestone and clay, etc., for cement making, inert materials for bricks, fine and coarse gravel, sand, brown coal; for use on civil engineering sites, in land reclamation, laying of drains, dams, sewers, laying of pipes and cables, subways and, finally, in private building and road building. In the four years in question, the number of excavators in use in Italy rose from 3 000 to 3 500, 86 % of which are mechanical and the remainder hydraulic (internal demand in 1963 was rather more than 70 % for the first type and nearly 30 % for the second).

As for foreign trade, exports rose during the period in question at an annual rate of 11 %, over 1/3 going to EEC member countries, 1/4 to EFTA countries (Austria, Denmark, etc.), 15 % to Mediterranean countries (Yugoslavia, Greece, Turkey, Egypt, etc.), 8 % to various African countries, 7 % to Latin America and the remainder to other countries. Imports virtually trebled in the period concerned (rate of increase over 30 %), rising from 50 to 150 units, mostly large capacity excavators (over 1 000 litres bucket capacity), originating mainly from Europe (the United Kingdom in EFTA and the Federal Republic and France in the EEC).

National output did not keep pace with the rapid growth in demand, because new factories were still

(1) As will be shown subsequently, the trend should be towards an increase in the present average power of 70—100 metric h.p. to an average of 120 metric h.p., covering the range 40—200 metric h.p.

(2) Small and medium-sized dozers also have applications in agriculture, for levelling out land, etc.

under construction and/or just commencing production, and as a result of changes in the types and ranges of machines required, as described below. In 1959, 290 excavators weighing 4 800 metric tons were produced, rising to 380 (6 900 metric tons) in 1963. Of the 1959 figure, 240 excavators (4 300 metric tons, average weight 18 metric tons) were mechanical and 50 (500 metric tons, average 10 metric tons) were hydraulic (83 % and 17 % respectively). In 1963, the distribution was 265 mechanical excavators (5 750 metric tons, average weight 22 metric tons) to 115 hydraulic (1 150 metric tons, average weight 10 metric tons), i.e. 70 % to 30 %. Thus, the number of mechanical excavators rose from 1959 to 1963 at a rate of less than 3 %, whilst the figure for hydraulic excavators represents a rate of increase of over 20 %.

These figures show a trend in both demand and output towards heavier and bigger-capacity excavators, with hydraulic types gaining on mechanical types.

The primary reason for these trends is that in Italy loaders have tended to replace excavators (even where excavators should really be used, especially on construction sites), owing to the greater mobility of loaders on the actual site and because it is easier to transport them from site to site. The latter factor is one reason why, in building, loaders have tended to be used in preference to excavators, i.e. because they are relatively easier to transport in conurbations. In road building, too, loaders are used where possible for excavation work, especially as they can load the excavated material directly on to the lorries used to carry it away. Of course, this application of loaders is only possible because the use of large dumpers is not established in Italy.

Loaders have not, however, replaced excavators for certain kinds of sites and for large-scale earth moving, where the latter are essential. They are also essential for crushing plants and, in general, for quarrying, land reclamation, dams, etc., and for all applications requiring large capacity excavators. Nevertheless, the rate of growth in the demand for and production of excavators reached a peak in 1956-57; as will be seen later, although still high until 1963, the rate of growth declined between that year and 1965, for the reasons already explained.

The growing importance of hydraulic excavators is due to advantages in operation, although these are at present limited to applications requiring small and medium capacity excavators, as the largest ones at present built have a bucket capacity of 500-600 litres. Hydraulic excavators penetrate more easily into the ground since the force exerted is continuous, and they are also more manoeuvrable and simpler to maintain than mechanical types; they are also easier to transport. During the period under consideration, hydraulic excavators have become more and more important in the laying of sewers, cables and pipes along roads, subways, underground railways and, in general, for excavations some 2-4 m deep.

In 1963-65, owing to the recession, which strongly affected the civil engineering sector, the above trends were accentuated.

The number of excavators in use at the end of 1965 remained more or less stationary at about the 1963 figure, and less use was made of them than in 1963. Most of the 1964-65 domestic demand was for replacements; the level of demand fell from 455 to 220 units, with the trend in favour of hydraulic types at the expense of mechanical types continuing (1).

Imports fell by 1/3 in comparison with 1963, whilst exports more than doubled, solely because Italian-built hydraulic excavators became popular on foreign markets (the level for mechanical excavators remained virtually stationary).

As a result of the increase in exports of hydraulic excavators, production in 1965 was only 26 % down on the 1963 figure: 300 machines (70 mechanical and 230 hydraulic). The recession thus accentuated the trend away from mechanical excavators without affecting progress in hydraulic types.

This trend has resulted in reorganization within the excavator sector. Some of the larger mechanical-excavator manufacturers have started building cranes or even ceased for the time being to produce excavators at all, in order to switch completely or partially to hydraulic types. It is therefore hard to estimate the real productive capacity of the sector; a normal level might be 8-9 000 metric tons/year (2); the larger factories in this sector in Italy normally work a single shift only.

To give a clearer idea of domestic supply, it should be mentioned that under normal conditions this consists, for mechanical excavators, of the output of a single large-scale manufacturer (about 200 units), situated in Central Italy, having a "vertical" structure and accounting for over 2/3 of national production of such excavators. There are also four smaller manufacturers in Northern Italy. All these factories also produce other machinery (the large manufacturer mentioned above also makes mobile cranes and crushers). Two factories in the North turn out hydraulic excavators, each having an annual output of about 100 units.

The average list price for excavators with 600-800 litre buckets, which, according to recent trends, is about the average size for mechanical excavators, is 1 050-1 950 lire/kg (3). The factory's selling price on the domestic market, less discounts, commission and

(1) The composition of the total number of excavators in use changed largely on account of replacements. In 1965 hydraulic excavators accounted for 23 % of the total, as against 14 % in 1963.
(2) Actual production in 1963 was about 7 000 metric tons.
(3) Mechanical excavator, 600-800 l capacity, 65-90 metric h.p., compressed air control system, basic machine including front loading bucket, weight 22-27 metric tons, average weight 23 metric tons.

net costs on transactions (trade-in terms) is 15-25 % less than the list price, depending on the organization and the methods of distribution. At present, the amount to be deducted for discounts, commission, etc., is 15-20 %, as direct distribution through firms' own distribution networks is the rule. However, this figure may again rise to 25 % (1) in terms of net yields because credits cannot be obtained for hire-purchase sales.

A large factory, able to distribute on a national level, would need 8 branches, suitably located by groups of regions, with their own staff and stocks of spare parts for service.

In the case of the home market, transport costs amount to 0.7-0.8 % of the list price, i.e. about 8 lire per kg of machinery (assuming maximum rates). Transport is normally by rail, or, for deliveries within a radius of 100 km, by lorry with a special trailer. The cost of the packing needed for shipment overseas, consisting of a base for slinging and further wooden boarding is about 240 000 lire for an average sized excavator, i.e. 13-14 lire/kg of machinery. Transport costs fob (excluding packing) from a factory in the Milan area would be 170 000 lire per unit, or 130 000 if the factory was located at a port, i.e. 10 and 7 lire respectively per kg of machinery. It should be noted that for reasons of competition the transport costs may be paid by the manufacturer, who then charges only the fob cost of the transaction. On the other hand, in the case of overseas sales, export premiums and refunds of turnover tax (IGE) may be sufficient not only to absorb these costs but even to allow certain price concessions.

For hydraulic excavators of the capacities at present produced in Italy, i.e. 400-600 litres, the list price is 1 030-1 190 lire/kg (1). The selling price, assuming distribution through branches and allowing for discounts, commission, net costs of the transaction and the risk of non-payment, is, for this type too, some 25 % below the list price. Owing to the weight and bulk of this type of excavator, transport and packing costs per kg of machinery are some 30-40 % higher than for mechanical excavators.

We now give market forecasts for Italy for 1970 and 1975, summarizing the figures given in Table 4.1.8. - LI. These forecasts are on the basis of future increases in the number of excavators in the various user sectors. For quarrying, where material is extracted for direct or indirect use in building and chemical works, the growth rate will be 3-4 %; for land reclamation, drainage, dams, etc. 2-3 %; for laying sewers, pipelines, cables, subways, etc. 5 %. These rates assume that the number of excavators will remain static throughout 1966 and part of 1967, when the use of excavators should return completely to normal. The overall rate of increase in the number of excavators will be 3 % approximately for 1965-70 and 3.5 % for 1970-75. The variation in "new" demand shown in the Table is derived from the annual increase in the total number of excavators. It has also been assumed that owing to replacement on account of physical deterioration and obsolescence, with the present trend continuing, mechanical excavators will by 1975 account for only 20 % of total numbers and the remaining 80 % will be hydraulic. According to the latest trends in demand, there will also be large capacity hydraulic machines from 1970.

Replacement demand has been estimated from past sales on the Italian market of the two basic types (mechanical and hydraulic), assuming an average life of 6 years for excavators built from 1966 onwards and of 9 years for those built in previous years. The change in average life is due to variations in the degree of utilization; in the case of mechanical excavators, it is reduced by obsolescence (3). On this basis, the rate of increase in replacement demand as a whole works out at under 5 % for 1963-70 and 10 % for 1970-75.

Total internal demand ("new" and replacement demand) is expected to rise from 220 excavators in 1965 to 620 in 1970 and 940 in 1975. The absolute increases, referred to the 1963 peak, will be 160 excavators by 1970 and a further 320 in the following five years. The rates of increase are 5 and 9 %, much smaller than the 12 % rate of 1959-63. The rates given refer to the demand for excavators in terms of numbers; they would be greater if they referred to total weight, in view of the increase in average capacity anticipated. This question will be gone into in more detail when dealing with forecasts of output.

Italian exports for the periods up to 1970 and up to 1975 will show a percentage fall as compared with the annual output figures. If we adjust output to a "normal" value, exports represent some 45 % in 1965. This figure will fall to some 30 % in 1970 and 1975. In terms of absolute figures, this still represents annual increases in exports of 6-8 %. On the other hand, the proportion of imports as compared with internal demand will also fall, assuming that they remain static at the 1965 level. This is justified as the large capacity excavators at present imported will be available from national manufacturers.

Production forecasts are based on internal demand and foreign trade. Production will be 760 excavators (13 000 metric tons) in 1970 and 1 200 (23 000 metric tons) in 1975. Again referred to the 1963

(1) Distribution through Federconsorzi would provide net yields 25 % below the list price. In this case, however, trade-in costs are included; these may reach a net value of 7 %; the risk of non-payment is also included.

(2) Hydraulic excavator, capacity 400-600 l, 45-70 metric h.p., hydraulically actuated, basic machine including front loading bucket, weight 9-10.5 metric tons, average weight approx. 10 metric tons.

(3) The sets of sales figures used (total domestic demand) in working out the replacement demand figures have been adjusted by means of shifting averages.

peaks, Italian output, in terms of numbers of machines, should increase at about 10 % per annum up to 1975. There will be an increase of 380 excavators by 1970 (referred to 1963) and a further 440 by 1975. In terms of weight, the increases will be 6 100 and 10 000 metric tons respectively.

In 1965 over 75 % of the number of excavators produced had bucket capacities not exceeding 500 litres, excluding the hydraulic type (average weight approx. 10.5 metric tons); the remaining 25 % consisted of excavators of 600-800 l capacity, almost entirely mechanical (average weight 23 metric tons). In 1970 the number of excavators not exceeding 500 l, all hydraulic, should account for half the national output; the other half will consist of higher capacity (800-1 000 l) excavators, with slightly more mechanical (average weight 30 metric tons) than hydraulic machines (average weight 17 metric tons). Production of hydraulic excavators of that capacity will have begun by then. In 1975 the trend towards large capacities will continue and only 30 % of the excavators produced will have capacities of 500-600 l; 70 % will be of 800-1 000 l capacity. The entire output of mechanical excavators will be 1/4 of the total for large capacity excavators, especially in the largest range (average weight 36 metric tons), the remainder consisting of hydraulic excavators (average weight 19 metric tons) (1).

This change in the types and ranges of excavators explains why the growth rate for production between 1963 and 1970 will be only 8 % in terms of weight as against 10 % in numbers. For identical capacities, the average unit weights of hydraulic excavators are much lower than those of mechanical types; the increasing popularity of the former slows down the rate of growth in terms of weight. In 1970-75, the result of the general increase in both hydraulic and mechanical excavator capacities will be an average annual growth rate of 12 % by weight.

Finally, it should be emphasized that with the shift in demand and production towards higher capacity excavators, there will be a bigger increase in total tonnage (of all excavators) if growth in the hydraulic sector as compared with total output is slower than anticipated.

The market for loaders in Italy

The Italian market for loaders practically quadrupled between 1959 and 1963 (see Tables 4.1.8. - XLIX and LII).

Domestic demand rose from 920 to over 3 200 loaders in 1963, an annual rate of expansion of over 36 %. Apart from replacement demand (400 machines in 1959 and 900 in 1963), this demand went towards increasing the number of loaders in use in the various sectors: quarrying, various industries for the storage of raw and bulk materials, private and public building, road building, land reclamation, etc. The number of loaders in use doubled in the period under consideration, rising to 12 500 in 1963, distributed among the above sectors as follows: 40 %, 30 %, 20 % and 10 % respectively. About 90 % of the loaders were tracked and the others tyred.

Demand from abroad more than quintupled in the period concerned: sales abroad rose from 180 loaders in 1959 to 1 030 in 1963. In the latter year, about 1/3 of the machines exported went to EEC countries (mainly the Federal Republic and France), a further 1/3 to EFTA countries (UK, Switzerland, Austria, in that order), about 1/4 to Mediterranean countries (Spain, Yugoslavia, etc.) and the remainder largely to African countries and Latin America. Owing to the rapid growth in Italian production, imports rose at the relatively low rate of 9 %, from 500 to 700 machines, despite the considerable increase in domestic demand. Purchases from abroad break down as follows: 1/4 from EEC countries (France and Germany), nearly 1/4 from EFTA countries (chiefly the UK), and the remaining 1/2 almost entirely from the USA. Imports were largely of high powered loaders (80-150 h.p., average 120, average weight 7-14 metric tons), mainly tyred, production of which in Italy (see below) was still restricted.

As regards internal supply, national production developed rapidly, from 600 loaders weighing some 6 000 metric tons in 1959 to 3 560 weighing some 38 000 metric tons, in 1963: an average annual rate of increase of 56 %. In 1959, 90 % of the loaders produced were tracked and 10 % tyred. In 1963, the latter type accounted for 15 % of total production. The tracked loaders ranged from 40-180 h.p. (average 100, most frequent value 80, average weight 10-12 metric tons), while the tyred ones ranged from 40 to 80 h.p. (average 60; average weight 6 metric tons).

The exceptional growth in the demand for and production of loaders in Italy is only partly connected with the expansion of activity in the user sectors in the years under consideration. As already mentioned, loaders have gradually ousted excavators in Italy in a large number of applications in building and road-building.

The growing trend in favour of tyred as opposed to tracked loaders is due to the greater mobility of the former, to easier maintenance and to higher speed in operation and transport. The figures for 1959-63 show clear tendencies towards an increase in power, as more powerful loaders have lower unit costs in earth moving. These trends have been slowed for the

(1) Of course, mechanical and hydraulic excavators have been divided into classes (capacities) since these contain most of the excavators concerned. There may still be small quantities of excavators of differing capacities in the future. These capacities may be less than the ones mentioned, which should be considered as modal groups, i.e. those occurring most frequently.

present by the limited load capacity of the lorries used to transport the earth, where these have not yet been replaced by suitable capacity dumper trucks.

Finally, although this is not evident from Table 4.1.8. - LII, there has been progress in the construction of loaders. Until recently, loaders were mainly built in Italy by attaching the appropriate equipment to agricultural tractors supplied by the automotive industry. Now, the same equipment is mounted on specially-designed tractor units supplied by the same industry for both tracked and tyred units.

The recession of 1964-65, which, as stated, hit activity and investment in the various civil engineering sectors hard, drastically reduced the market for loaders in that period. Internal demand fell to 1 500 machines in 1964 and 1 200 in 1965, a total fall of about 1/3 as compared with 1963. Internal demand in 1965 was entirely replacement demand; the number of loaders did not increase any further and they were used less. Imports fell by more than 1/3, to 450 units, and exports by nearly 1/5, to 850. These foreign trade figures, especially for exports, are subject to alteration as they are based on estimates (as are all the 1965 figures). If they are confirmed, this will be one of the few mechanical engineering sectors where the effect of low domestic demand was not offset by higher sales abroad, although with reduced profit margins. Nevertheless, the figures show a small increase in net exports (excess of exports over imports).

Production in 1965 fell to 1 400 loaders (weight 14.5 metric tons), down by 60 % on 1963. This fall was due not only to the contraction in home demand but also to partial absorption of stocks which had piled up in 1964. Nevertheless, the trend in favour of tyred loaders persisted, accounting for 20 % of total output in 1965. These consisted of loaders with an average power of 70 h.p.; some factories also produced a very small number of 80 and 100 h.p. models.

The structure of the sector is such that it consists of just one large-scale manufacturer, who under normal conditions produces about 80 % of the national output. The group has one factory in Northern Italy, producing mechanical parts and carrying out assembly work, a second factory in Central Italy producing certain units which are supplied to the first and a third factory in France, which also produces and assembles various units. The group operates in collaboration with two large automobile firms, one in Italy and one in France. The group also produces other earth-moving machinery, angledozers, graders and scrapers. The remaining 20 % of national output is split up among about ten manufacturers, all based on Central and Northern Italy and generally not producing more than 50 loaders per year; they, too, also manufacture other products, such as tractors.

The list price of the most popular loader in Italy, a tracked loader with a front-loading bucket, 80 h.p. power, average weight 10.5 metric tons, is 9.2-10.4 million lire, which, depending on variations in the weight of the machine, corresponds to 870-1 000 lire per kg. The selling price ex-works, i.e. less discounts, commission and costs, is 15-25 % less than the list price, depending on the organization and methods of distribution (1). A large factory able to distribute on a national level, as in the case of excavators, would need an adequate number of branches, one for each group of regions, with their own staff (including service engineers at service centres) and stocks of spares.

The cost of transport by lorry, for points of delivery in Italy, varies from 70 000 to 120 000 lire according to the type of loader, i.e. 7-11 lire per kg of machinery. For continental exports the cost of transport from a factory in the Milan area free to frontier would be about 7 lire/kg of machinery.

For overseas exports, the cost of the necessary packing must be added to the cost of transport fob. This packing consists of a wooden casing covering the seat, controls and the entire loader to half-way down the tracks; the packing costs about 30 000 lire. The total cost of overseas shipment (packing, transport and loading on board) would thus amount to 13 lire/kg of machinery for a factory in the Milan area or 10 lire if the factory were near a port.

As regards shipment, it should be borne in mind that under the particular conditions of competition on the domestic market, transport costs, etc., can be partly or totally met by the manufacturer. The same may apply to overseas shipments, where the manufacturer receives an export premium of some 30 lire/kg and a refund of the 6.6 % turnover tax (IGE), thus enabling him to absorb these costs and to grant certain discounts demanded on the national market.

The list price of the corresponding 80 h.p. tyred loader, average weight 7 metric tons, of Italian manufacture, is 9.8-11.2 million lire, representing 1 400-1 600 lire/kg. The list price of imported loaders is 1 800-2 100 lire/kg; if customs duty and international transport, which together amount to 25 % of the list price, are deducted, the price per kg is approximately the same as for Italian-produced loaders. As in the case of tracked loaders, the selling price ex-works is 15-25 % less than the list price, depending on the system of distribution.

For the same tyred loader of 80 h.p., the cost of transport by lorry on the Italian market is some 10-17 lire/kg of machinery, depending on the distance to the point of sale. The cost of transport free to frontier from a factory in the Milan area would be some 10 lire/kg of machinery. For overseas shipments, the cost of packing, transport and loading on board would be about 20 lire/kg of machinery for a

(1) See corresponding note on p. 135; the most common form of distribution on the home market being through "Federconsorzi".

factory in the Milan area, or 15 lire if the factory were close to the port of embarkation (1). For overseas exports, the same applies as regards premiums and refunds of turnover tax (IGE) as in the case of tracked loaders.

A summary of market forecasts for Italy up to 1970 and up to 1975 is given in Table 4.1.8. - LIII. As in the case of excavators, the forecasts are based on future increases in total numbers in use, split up over the various user sectors. For loaders used in quarries directly or indirectly yielding building materials, the rate of increase in numbers is assumed to be 4 % for the period under consideration; for loaders used in the storage of raw and bulk materials, 5 %; for public and private building, 4 %; for road building, 1-2 %; and for land reclamation, etc., 2-3 %. The basis of application of these rates is the total number of loaders in use in 1965, assuming a gradual return to normal in the degree of utilization.

The growth in numbers in the user sectors taken as a whole works out at 4.3 % for 1965-70 and 4.6 % for 1970-75. The progress of "new" demand depends directly on the above increases, and, as the Table shows, it will not equal the 1964 peak even in 1975.

Replacement demand is calculated on the basis of past sales on the Italian market, assuming that the average life of a loader is 5 years for loaders built from 1966 onwards and 6 years for those built in previous years (the set of sales figures used, representing total domestic demand, in order to determine the annual replacement figures, has been adjusted by means of shifting averages). The normal rate of increase in replacement demand will be 13 % in 1965-70 and less than 8 % in 1970-75.

Total internal demand ("new" and replacement demand) will be over 2 800 loaders in 1970 and about 4 300 in 1975. Internal demand, at least when expressed in terms of numbers of loaders, is thus not expected to exceed the 1963 peak in 1970; it will, however, exceed this level in 1970-75, rising to 1 000 more machines than in 1963. However, the trend towards greater power will mean that loaders will become heavier. The average power now is 80 h.p.; this should rise to 150 by 1975. In terms of weight, the 1963 level of internal demand will be exceeded by 1970, and the increase in 1970-75, in terms of weight, will be considerably more than in terms of numbers. In particular, the average weight of tracked loaders, now 11.5 metric tons, will be 14 metric tons in 1970 and 16 in 1975; that of tyred loaders will increase from 6 to 12 and 14 metric tons respectively for the above years (2).

(1) Transport costs are higher for tyred loaders than for tracked types, as the former are heavier for the same bulk.
(2) The average unit weights of tracked loaders of 89, 120, 150 and 180 h.p. are 10.5, 15, 18 and 20 metric tons respectively. The average unit weights of tyred loaders of the above powers are 7, 11, 14 and 16 metric tons respectively.

Italian exports could increase at a rate of 12 % from 1965-70 and 8 % over the next five years. The growth in exports will be rendered possible mainly by widening the production range of the sector in question (not only in terms of power but also by increased output of tyred models and not only tracked types). The absence of the latter factor is also the main reason why imports are expected to remain static at the levels attained around 1965.

As a result of the growth expected in home demand and in foreign trade (as well as the increase in unit weights), Italian output of loaders should rise to nearly 4 000 units (about 52 000 metric tons) in 1970 and 6 000 units (88 000 metric tons) in 1975. In comparison with the 1963 peak in production, there should be an increase of 400 loaders up to 1970, equivalent to 14 000 metric tons, and a further increase of over 2 000 loaders (36 000 metric tons) from 1970 to 1975. The trend towards tyred types means that 75 % of total output will be of this type in 1975. If this trend is not as strong as we have assumed, the increases in production in terms of weight will be larger still, as tyred loaders are lighter than tracked ones of the same power. Furthermore, articulated types will probably be gaining ground among tyred loaders shortly. For this and other reasons, activity in the sector, in terms of the production of mechanical components, may be greater than expected if loader manufacturers produce the entire unit (other than the engine) instead of obtaining the tractor section from other firms—apart, of course, from normal subsidiary unit inputs and standardized commercial products of other intermediate units.

The market for large and medium capacity mobile cranes in Italy

Reference has already been made to the advantages of an excavator factory producing mobile cranes of large and medium capacity, i.e. 10 metric tons and over. The market for these in Italy grew rapidly between 1959 and 1963, expanding at an annual rate of 25 % in that period (see Table 4.1.8. - LIV).

Home demand in particular doubled: from 35 mobile cranes in 1959 it grew to 75 in 1963 (annual rate of 21 %). The growth in internal demand was due mainly to "new" demand (growth rate 16 %), but there was also growing replacement demand. The distribution of the mobile cranes in use amongst the various applications was: 70 % for the erection of buildings, etc., heavy prefabricated structures such as bridges, flyovers, etc. on sites where it was not possible to use slewing-jib type fixed cranes; 20 % inside factories for handling machinery and plant and for installation and maintenance, etc.; and 10 % for hoisting operations at ports. Lorry-mounted cranes predominate in the first group and self-propelled ones in the second and third; lorry-mounted cranes are required, in general, by sub-contracting firms of erec-

tors, which have to transport their cranes rapidly over long distances. Self-propelled cranes, on the other hand, are used more within factories and ports, etc., where they do not have to move far.

In 1963, 2/3 of the total home demand was "new" and 1/3 replacement demand. Of the types in demand on the home market, about 65 % consisted, in 1963, of mobile cranes with capacities of 10-22 metric tons and 35 % of cranes with higher capacities. The proportion of lorry-mounted to self-propelled types was roughly equal to that given for the distribution of cranes in use by applications.

Exports were virtually non-existent in 1959, and even in 1963 were limited to 10 mobile cranes (total weight 190 metric tons) all of less than 22 metric tons capacity; these went mainly to Mediterranean countries (Yugoslavia, etc.) and Eastern Europe (Hungary, etc.). In 1959-63, imports rose from 15 to 25 mobile cranes (total weight 675 metric tons) with capacities exceeding 22 metric tons, practically all from the USA and practically all large capacity lorry-mounted types. Output rose threefold in that period (annual rate 32 %); in 1963 it amounted to 60 units weighing 1 140 metric tons. The cranes produced in Italy had capacities between 10 and 22 metric tons; the average capacity was 16 metric tons and the average unit weight 19 metric tons.

In 1964, despite the recession, home demand fell by only 7 % and remained at the same level in 1965 (70 units), in which year the recession continued. Apart from replacement demand, this shows that the total number of mobile cranes in use at the end of 1965 was 410, distributed by applications more or less as stated above. The increase in numbers was cut by half as compared with the previous period.

Whilst exports continued to rise (15 mobile cranes in 1965), imports fell by 40 % (15 mobile cranes).

As a result of the growth in foreign trade, which compensated for the contraction in home demand, home output in 1965 (mainly on a single shift basis) works out at 15 % more than 1963: 70 mobile cranes, weighing, in all, 1 330 metric tons.

Only 4 manufacturers produce mobile cranes with capacities exceeding 10 metric tons, and all are in Central and Northern Italy. The largest factory, which is the only one producing mobile cranes with capacities of over 18 metric tons, is located in Central Italy and accounts for 60 % by weight of the national output. The remainder is split up amongst the other manufacturers, each producing 10-20 mobile cranes per annum. Construction of mobile cranes is combined with that of other products, as in the case of the largest factory, which also produces excavators; other factories also turn out small capacity mobile cranes mounted on ordinary industrial vehicles, etc.

As regards marketing (for the larger factories) the same applies as for excavators (q.v.).

The average list price of a medium-sized self-propelled crane of 16 metric tons capacity and weighing, on average, 19 metric tons, is 19 million lire, i.e. 1 000 lire/kg. The average price for lorry-mounted cranes of the same capacity is 1 100 lire/kg. The actual selling price, i.e. deducting discounts, commission and any other net expenditure, is 15-20 % less than list (1).

Transport is generally by rail for the self-propelled types and by their own power for lorry-mounted types. Concerning transportation costs for the former and, in general, the cost of special export packing and charges for delivery fob, etc., see the corresponding figures for excavators, as the costs per kg of machinery are similar.

Table 4.1.8 - LV contains market forecasts for Italy for the periods up to 1970 and up to 1975. In the case of mobile cranes, again, forecasts for home demand are based on forecasts of the future growth of the numbers in use, which in turn are based on the activity of the user sectors, in accordance with the following annual rates (2): Erection work 8 % (sheds, etc. 10.4-10.6 %, prefabricated buildings 8.0-8.5 %, positioning of bridges, flyovers, etc. 2 %), factories 10-7 %, hoisting operation in ports 12-10 %. Total numbers should increase at a rate of 8.6 % from 1965-70 and about 9.5 % from 1970-75 (the annual increase from 1959-63 was 16 %).

"New" home demand was derived directly from proposed increases in total numbers; it will rise by less than 5 % in the first five years and 11 % in the second.

As in the case of excavators and loaders, replacement demand was determined from sets of past home sales figures, taking the average life of a mobile crane to be 10 years up to 1965-66 and 8 years thereafter (3). According to our calculations, replacement demand will increase in 1965-70 at 15 % and in 1970-75 at 5 % (owing to the slower increase in the number of units in use after 1963, and in particular up to 1966).

Total home demand ("new" and replacement demand) will rise from 70 mobile cranes in 1965 to 110 in 1970 and over 160 in 1975. For reasons associated with economy of use, the composition of home demand is likely to alter, in that there will be relatively more large capacity mobile cranes (over 22 metric tons, average unit weight 30 metric tons) as opposed to medium capacity types. The former accounted for 33 % of total sales in 1963-65 and should account for 50 % in 1975.

(1) Net yield is probably reduced by a further 5 % as a result of non-payment by customers.
(2) Where two rates are given, separated by a hyphen, they refer respectively to the periods 1965-70 and 1970-75, when the rates are considered likely to differ in the second period.
(3) The figures obtained from sets of sales figures for the home market, before and after the reference year, have been adjusted by means of shifting averages.

Exports, to EEC countries and, particularly, overseas, are expected to rise at about 10 % per annum. This rate of growth is possible as a result of the present low level of exports and it meets the limited aim of maintaining the present ratio between sales abroad and production in the sector. Imports should fall, as the sector will be able as from about 1970 to supply mobile cranes for the home market having capacities considerably in excess of 22 metric tons, which now have to be imported.

Forecasts of national output are derived from the forecasts of home demand, exports and imports. In 1970 120 mobile cranes will be produced, rising to almost 200 in 1975. Owing to the increase in capacities, outputs by weight in those years will be 2 500 and 4 900 metric tons respectively. Thus, production will increase at an average annual rate of 10-11 % (by numbers) and 13-14 % (by weight) in the years up to 1975. These levels will entail increases in the sector's present output of 1 200 metric tons/year up to 1970 and 2 400 metric tons/year up to 1975.

Concerning types of mobile cranes, the above mentioned increases in supply and demand ought basically to affect lorry-mounted cranes, as a result of progress in the user sectors. However, to the extent that large and medium capacity mobile cranes capable of greater road speeds than the existing ones (from a maximum of 20 km/hr to 45-50 km/hr, as in the case of lorry-mounted cranes) are designed in the future, this type should account for most of the increases. Apart from the drawback of low road speeds, self-propelled cranes have the advantage that one man is both driver and crane operator, whereas two-man operation is necessary for lorry-mounted types; further, 360° slewing of the jib is possible with self-propelled types, as against 270° for lorry-mounted cranes, thus reducing manoeuvring times and permitting travel over short distances at low speeds; this is safer, more rational and more accurate, especially in the case of large capacity cranes with wide range slewing and when it is necessary to position heavy suspended loads. Finally, self-propelled cranes are simpler in structure, having only one engine (lorry-mounted types have two separate ones), so that operating costs are lower.

The market on which the projected unit can count and its size

Since our aim is to set up a new factory which is to be internationally competitive, producing loaders and excavators, and, on a secondary basis, mobile cranes and dumpers, its scale must not be smaller than that of the largest existing Italian manufacturers in the field, so that the factory can be economically provided with suitable equipment, processes, studywork and design departments and commercial organization. The technical and economic requirements of the factory must allow for increased international competition in the next few years, especially within the European market, if and when protective customs duties vis-à-vis the USA are lowered. In setting up the projected unit, it would be useful to consider the possibility of a joint initiative by the two largest Italian manufacturers, together with certain large firms in other EEC countries and/or in Britain and America; one of the advantages of this would be that the new unit would be assured of ample prospects on the world market.

On this assumption and on the basis of the forecasts and nature of the demand and degree of competitiveness anticipated, the factory to be erected in the area of the pole could be on a scale consistent with a "normal" output of 18 000 metric tons. The approximate breakdown of this figure is as follows:

	Average weight	Home market	Exports	Output	Total
	(metric tons)	units	units	units	(metric tons)
Loaders	—	*500*	*330*	*830*	*10 000*
– 80 h.p.	7.0	90	60	150	1 050
– 120 h.p.	11.0	150	100	250	2 750
– 150 h.p.	14.0	200	130	330	4 600
– 180 h.p.	16.0	60	40	100	1 600
Excavators	—	*170*	*80*	*250*	4 150
– Bucket capacity 600 l	10.5	30	10	40	420
– Bucket capacity 800 l	14.5	40	20	60	870
– Bucket capacity 1 000 l	19.0	100	50	150	2 860
Mobile cranes					
– Capacity 20-40 metric tons	30.0	30	15	45	1 350
Dumpers					
– Capacity 20-25 metric tons	20.0	35	15	50	1 000
Spares	×	×	×	×	*1 650*
Total	×	×	×	×	18 150

The loaders produced would be tyred types (including some articulated), of powers as above, with various alternative types (rear or side unloading, etc.) and with various special accessories (special buckets, blades, rippers, etc.).

The excavators produced would be basically hydraulic types of the capacities stated, although at present excavators with buckets exceeding 600 l are not yet in production. Different kinds of excavators will be produced, for forward and backward excavation, automatic unloading, crane hoisting, etc.

The production of cranes will be based on newly designed fast self-propelled types (see 5.2.6.1.5); there will be various models having different jib lengths, etc.

The dumpers produced will have capacities of 20-25 metric tons (unit weights 15-24 metric tons). There will be heavy models (for rock, boulders, etc.) and medium-heavy models (for gravel, sand, earth, etc.).

A further 10 % should be added to the outputs and sales quoted, to cover spares.

The feasibility of sales by the projected factory is demonstrated by comparison with the previous tables containing market forecasts up to 1970 and up to 1975.

The output of loaders of the unit in question will represent less than 1/5 of the national output between 1970 and 1975. In terms of weight, this output corresponds to a 1-2 year increase in national production as expected for 1970-75. As regards sales on the home market, in terms of numbers of loaders, even if the considerable increase in their power and weight in the period concerned is disregarded, the loaders produced by the unit would be absorbed by the increment in home demand in the 2-3 years following 1970, at which time the 1963 peaks will be exceeded.

The unit's excavator output, when working normally, will amount to 1/4 of national production. This output, and corresponding sales on the home market, should cover some 2-3 years' increase in both during the period after 1970, when the 1963 peaks will have long been left behind and numbers in use will therefore be well above the present figure.

The new factory, when working normally, will be producing 1/3 of the national production of mobile cranes. Both production and sales by the unit on the Italian market should cover about 3 years' requirements for the increases forecast for national production and home demand from 1970-75. In this field, too, existing units are expected to expand substantially by 1970. The same applies to the production and sale of dumpers in Italy.

The anticipated level of sales abroad of loaders, excavators, mobile cranes and dumpers, in the EEC and, particularly, overseas, is roughly equivalent to the ratios, on a sector basis, between exports and production. These ratios do not in general exceed those of recent years, and still less the exceptional levels now being recorded.

Unit VII

CRANES AND MECHANICAL CONVEYORS

The market for cranes and conveyors in the EEC

The market for cranes and conveyors is a part of the larger market for hoisting and conveying equipment. For the purposes of a general examination of the products with which the projected unit will be directly concerned, we can exclude lifts, hoists, cableways, telpherages and conveyors and lifts used in mining, as well as lift trucks, which are covered by another project (Unit VIII).

The hoisting and conveying equipment here examined thus includes bridge cranes, other cranes (gantry, naval [1]), special cranes, etc.), hoisting blocks and tackles, jacks, winches and windlasses, grabs, etc., and mechanical conveyors (other than for mining), etc.

It is difficult to analyse the market for lifting and conveying equipment, as the statistics available in some countries do not distinguish between the various types of equipment but lump them together in accordance with various criteria, e.g. by the sectors using them. In other countries the figures are expressed in quantities under headings lumping together types which differ in unit weight, technical and operating characteristics, value, etc. For many types of equipment (cranes, conveyors, winches, windlasses, grabs, tackles, etc.), production statistics do not include "home-made" products, which are significant in many industries, particularly in large factories. Further, for some products, such as cranes, the statistics may or may not include structural parts (which may be made by the hoisting equipment factory or supplied by structural component factories), or they may include only part of production, as in the case of conveyors, the remainder being included under the headings of various sectors, such as foundry, iron and steel, mining, etc.

For these reasons, and because of other factors which seriously affect the comparability of production and foreign trade figures of the individual member countries of the EEC, laborious estimates have had to be made, some of them on the basis of direct information from large manufacturers in the EEC. These estimates render it possible within rough limits to summarize the EEC market (Table 4.1.8. - LVI).

The market for the hoisting and conveying equipment concerned appears to have expanded in the EEC

[1] Tower cranes are excluded ; these also used to be used in shipyards but are now obsolete owing to the latest technical requirements of shipyards.

between 1959 and 1963 at an average annual rate of 10 %.

Internal demand grew at a slightly higher rate and exceeded one million metric tons in 1963; exports to non-member countries rose at a rate of 8 % and exceeded 115 000 metric tons in 1963. Production rose at a rate 9 % below overall demand; consequently, although the level of imports was not in itself excessive—58 000 metric tons in 1963, equivalent to 1/20 of home demand—the relative level rose sharply.

Trade between countries within the EEC (88 000 metric tons in 1963) did not exceed 9 % of home demand in the EEC as a whole, but was more than double the 1959 figure. Within the EEC, the Federal Republic of Germany exported more than it imported, France virtually broke even and the other countries imported more than they exported.

The market expanded in the individual member countries (other than Italy) at a rate roughly equal to the EEC average. The growth of demand in the individual countries, however, varied widely from country to country: Italy 17 % rate of increase, Benelux 12 %, Germany 9 %, France approx. 8 %.

Out of a total output of about 1.1 million metric tons, Germany contributed 524 000 metric tons (48 % of the total, rate of increase 9 %), followed by France with 300 000 metric tons (27 % of the total, rate of increase 7.4 %), Italy with 216 000 metric tons and Benelux with 54 000 metric tons.

The broad categories of equipment making up the 1963 output of the EEC were:

	Metric tons	%
Bridge and other cranes	768 000	70
Continuous mechanical conveyors	180 000	16
Blocks and tackles	94 000	9
Other	53 000	5
Total	1 095 000	100

This reveals the importance of cranes and conveyors as against the other equipment.

It should be remembered that cranes of a certain capacity and having certain characteristics are not produced in long and medium runs, as are blocks, tackles, jacks, etc. The different programming requirements for cranes and small hoisting apparatus make it difficult to combine the production of the two categories of equipment, with opposing conditions; such a complex organization would be necessary that there would be technical and economic difficulties and imponderables. There is just one large German firm, the largest manufacturer in the EEC, which constructs all these kinds of hoisting equipment, but it has separate factories for the different products.

Similar considerations apply to belt conveyors—these will be gone into in further detail subsequently—which are divided into mass produced and non-mass produced types.

As for cranes (bridge and other types, except tower cranes for building), the market in the EEC for the member countries in 1959 and 1963 may be determined from the following production figures (figures in metric tons):

Country	1959	1963	Average annual growth rate
Benelux	20 600	28 000	8.0 %
France	168 000	216 000	6.5 %
Federal Republic of Germany	253 000	368 000	9.8 %
Italy	92 400	156 000	14.0 %
EEC	534 000	768 000	9.5 %

The rates of increase in production in the different countries thus vary widely, especially as regards Italy, where the high rate of expansion of production and home demand may be due, as explained later on, to the original backward situation of the country, which it rapidly overcame.

The rate of expansion in the Federal Republic, above average for the Community, is due not only to home demand but also to exports, which account for over 1/4 of production.

In view of the factors affecting the demand for cranes in the EEC as a whole, which depend on the progress of the iron and steel industry, manufacturing industries and especially the mechanical engineering industry, the progress of transportation and vigorous exports, it may reasonably be assumed that production of cranes in the EEC should increase at a rate of at least 6-7 % in the next decade. On this basis, total production in the EEC will double, reaching 2.5 m. metric tons in 1975.

From the point of view of setting up a new crane factory in the Mezzogiorno capable of competing both at home and abroad, it is interesting to consider the scale of the largest existing manufacturers in the EEC.

As stated, the largest factory is in Germany, and has a productive capacity of some 60 000 metric tons/ year. There is another factory of 35 000 metric tons capacity and further ones of 20 000-25 000 metric tons/year. In the other member countries the

largest factories have outputs around 20 000 metric tons/year; 2 in France, 1 in Belgium, 1 in the Netherlands, and 3 in Italy. In the EEC as a whole, there are less than 20 units with capacities of around 10 000 metric tons/year.

That is the limit above which a unit may be considered relatively large. In this connection it should be noted that factories must be on a large scale, even when the cranes are not mass produced (cranes of over 50 metric tons capacity and for continuous heavy duty service), in order to produce an adequate output and achieve success on the market. Only beyond a certain size is it possible to make economic use of special equipment, advanced design departments, patents, licences and constructional features deriving from long experience, as well as to develop a satisfactory commercial organization. This does not mean that medium and small to medium factories cannot produce good, competitive products, but only in the field of small or standard cranes, in which competition is intense.

As already stated, after cranes the most important hoisting and transportation equipment in the EEC are continuous mechanical conveyors of all kinds. Production figures (in metric tons) are given for these for the member countries in 1959 and 1963:

Country	1959	1963	Average annual rate
Benelux	11 000	17 000	11.5 %
France	29 000	46 000	12.2 %
Federal Republic of Germany	61 000	87 000	9.3 %
Italy	17 000	30 000	15.2 %
EEC	118 000	180 000	11.1 %

Production in the EEC in 1963 had reached 180 000 metric tons, growing at a rate of 11 % as compared with 1959. Production in Benelux and in France rose at a rate close to that of the EEC as a whole, whilst in Italy, as we shall see, the much higher rate of 15 % reflected the efforts made to modernize productive structures in various sectors. In Germany, the rate of increase is slightly below the average for the EEC, as production had already reached a high level and the user sectors were already well equipped.

Trade within the Community was dominated by the Federal Republic and France, whose exports, including those to non-member countries, accounted for 20 % and 15 % respectively of production.

Taking account of recent trends and other factors, it may be assumed that the output of continuous mechanical conveyors in the EEC will grow over the next 10 years at a rate of about 8 %, reaching 480 000 metric tons in 1975.

Finally, it should be mentioned that the conveyors under examination can be divided into mass produced and non-mass produced types. The main non-mass produced types are belt conveyors, whilst other types, such as chain and roller conveyors, are mainly mass produced. Bearing in mind our previous remarks on the inadvisability of combining the construction of products with inconsistent programming requirements, the production in a single factory of mechanical conveyors and large capacity cranes for heavy duty continuous service is only conceivable for non-mass produced types.

There are 3 large firms making large non-mass produced conveyors with capacities of over 5 000 metric tons in the EEC. There are also large organizations of US origin which can "produce" considerably greater quantities, but their work is mainly design and the assembly of mechanical and electrical parts sometimes imported from the countries of origin and sometimes produced locally under licence.

Since competitiveness in the field of non-mass produced conveyors largely depends on the design of systems, especially in the case of complex conveyors, it may be assumed that a factory with an output of 1 000 metric tons/year can operate satisfactorily on a Community scale if it forms a part of a large unit also turning out other non-mass produced hoisting equipment, such as cranes, etc.

The market for cranes and continuous mechanical conveyors in Italy

The market for hoisting and conveying equipment has expanded rapidly in previous years. From 1959 to 1963, the average annual rate of increase in overall demand was 17 %, due mainly to the expansion of home demand; external demand was minute and increased at the lower rate of 8 %. Production, rising at a rate of 14 % per annum, was outstripped by demand. Consequently, imports rose sharply. Part of the increase in home demand was exceptional, needed for certain large-scale industrial projects requiring special types of equipment not manufactured in Italy.

With internal demand at 244 000 metric tons in 1963, over 15 % was covered by imports, which amounted to 37 000 metric tons, of which half came from EEC countries (mainly Germany) and the remainder from EFTA countries (UK) and, in particular, the USA.

Home demand, (in metric tons) for 1959 and 1963 was as follows:

	1959	1963	Average annual rate
Bridge and other cranes	91 070	180 340	18.6 %
Continuous mechanical conveyors	17 714	35 141	18.7 %
Blocks, tackles, etc.	20 916	28 619	8.1 %

An examination of the levels and rates of growth of Italian domestic demand for the broad categories of lifting equipment bears out and emphasizes what has already been said about cranes and mechanical conveyors on the EEC market as a whole.

Cranes

The basic figures concerning the market for cranes (other than for building) in Italy are as follows (in metric tons):

	1959	1963	Average annual rate
Production	92 400	156 000	13.9 %
Imports	2 300	27 000	72.0 %
less : Exports	3 630	2 660	— 8.1 %
Home demand	91 070	180 340	18.6 %

The growth of demand in the period was due exclusively to home demand, as the already limited level of exports fell still further. The level attained by internal demand was due to a great extent to substantial investments in iron and steel, especially in 1963-64. Excluding iron and steel, purchases by other sectors rose at the nevertheless considerable rate of nearly 16 %.

External contributions to home demand were increasingly evident. In 1959 imports accounted for only 2.5 % of home demand; by 1963 this figure had reached 15 %; as already stated, the increase in imports was primarily due to development programmes in the iron and steel industry and affected mainly purchases from the USA.

In 1963, the breakdown of home demand for cranes, other than for building, by sector, was roughly as follows:

Sector	Metric tons	%
Iron and Steel	38 700	21.5
Other industries	110 000	61.0
Electricity	10 000	5.5
Transport (ports etc)	21 640	12.0
Total	180 340	100.0

The above distribution cannot, however, be considered normal for the reasons analysed above, so that the "normal" relative weights of the other user sectors are reduced.

About 60 % of output in 1963 consisted of bridge (travelling overhead) cranes and the remainder of other types: half of these were gantry cranes and the other half were for naval use (in ports and shipyards) and special cranes.

It is estimated that home demand for cranes in 1965 will be down to 90 000 metric tons, half the 1963 figure, as a result of the recession, which drastically affected investments in all the productive sectors, and because the preceding phase of expansion of the Italian iron and steel industry was practically complete. Production, however, appears to have fallen less, to 94 000 metric tons (as against 156 000 in 1963), as it replaced imports, which slumped to about 1 000 metric tons, and because of the export drive, which resulted in sales abroad of 5 000 metric tons.

The productive potential of the Italian crane industry, excluding tower cranes for building, is assumed to be greater than 180 000 metric tons/year, although the "normal" capacity should properly be considered at around the 1963 peak.

In terms of potential, 16 factories exceed 5 000 metric tons/year, of which 8 exceed 10 000 metric tons and only 3 have potentials of 15 000-20 000 metric tons/year. In the Mezzogiorno there is a single unit, which has a potential of about 10 000 metric tons/year, in the Naples area (within a shipyard). Of the three largest factories, 2 belong to the IRI "Fincantieri" group and the other, belonging to a private firm, produces hoisting and other equipment.

53 % of "normal" capacity is made up of factories with capacities of over 5 000 metric tons/year, 22 % of factories of 3 000-5 000 metric tons/year capacity and 25 % of units with capacities up to 3 000 metric tons/year (the small to medium sized units).

Note that 40 % of the industries using small capacity cranes with standard specifications place their orders with small to medium factories in the crane industry; 60 % of home demand, however, is for cranes of higher capacities and with special features, which can only be built by factories above a certain size, having technical offices, experience and the necessary plant.

In general, Italian crane manufacturers have less experience than those of other countries, such as the USA and the Federal Republic of Germany, where the development of heavy industry began much earlier and on a much wider foundation. Consequently, there is considerable competition in Italy from large foreign crane manufacturers and their licensees. Only a small number of large Italian crane manufacturers (5 in all) have American or German licences, which enable them to be highly competitive on the market; recent downward trends in imports are due mainly to the activity of firms operating under licence.

Sales take place through agents or regional offices of the crane manufacturers.

The average price of large cranes and those with special features at present varies from 500 to 600 lire/kg unassembled. In view of the fierce competition between manufacturers, the selling price tends to be roughly equal all over Italy and the cost of transport, at least as far as regional differences are concerned, is often absorbed by the manufacturer. The above average price thus includes transport costs.

Transport, especially for large cranes, is generally by road in view of the size of the unassembled components; where necessary, special vehicles are used. Transport costs for a factory in the "industrial triangle", for deliveries in Central and Northern Italy, work out on average at 5-7 lire/kg, and for the mainland of the Mezzogiorno, 10-15 lire/kg.

Export selling prices outside the EEC are on average 450-550 lire/kg (fob), allowing for the 15 lire/kg export premium and refunds of indirect taxes of 7.2 %. Transport costs to the port of embarkation and loading at the port amount to some 5-6 lire/kg for factories in the North; for those near the ports, the figure is only 2-3 lire/kg.

The base year for the forecasts of demand and output is 1965, since the 1963 peak was attained under boom conditions. The basis is not the actual levels in 1965 but assumed "normal" levels, as if there had not been a recession, and allowing also for the fact that the circumstances of the ten-year "economic miracle" no longer apply.

Actual home demand in 1965 is likely to be 90 000 metric tons, and the "normal" demand works out at 117 000 metric tons, over 1/3 less than the 1963 level (see Table 4.1.8. - LVII). In particular, the "normal" demand for cranes for the iron and steel industry in the base year is more than halved as against 1963, and for other industries and transport it is down by over 30 %.

In contrast to expectations for other heavy structural component groups, it is not felt that the home market for cranes is, in general, likely to be substantially affected by factors increasing demand more than proportionately to total investment and production in the user sectors over the next 10 years. Thus, up to 1970 and up to 1975 the demand for cranes for the iron and steel industry is expected to grow at an average rate of 8 % and, for other industries and electricity, 7 %.

The demand and growth rate in the iron and steel industry could, in fact, be higher; this, however, depends on future expansion plans in the industry which have not yet been published, and on technological factors which might affect the use of cranes in the industry. Furthermore, it is hard to represent programmes which are in practice concentrated in a few years and which cause considerable fluctuations in demand, by annual "normal" figures.

The rates of increase in demand postulated for other industries may also be considered conservative as they are less than half those of previous years. It should, however, be borne in mind that lift and carrier trucks may also partially oust certain types of cranes in some sectors.

As for home demand for cranes in the transport sector, Table 4.1.8. - LVII allows for the fact that in the next 10 years much of the urgent programme of modernization and development for the Italian ports will be implemented; this programme cannot be axed. It has been assumed that investments in each year will be roughly equal.

To summarize, home demand for cranes should rise to 174 000 metric tons in 1970 (still below the 1963 level), and to 233 000 metric tons in 1975 (annual growth rates: 1965-70: 8.3 %; 1970-75: 6%).

In view of the present low level of sales on the home market, which is likely to persist for a few years, it is very likely that the existing export drive will continue, even with reduced profit margins. Exports should be assisted by the fact that manufacturers, who are now working below capacity, would be able to offer shorter delivery periods than their foreign competitors on the international market. The forecasts for exports in 1970 and 1975—in the latter case they should reach 16 000 metric tons, according to the table—could be exceeded, especially if the larger Italian factories maintain their present productional and commercial efforts on foreign markets, especially outside Europe. Imports, for the reasons stated, will tend to remain constant at 1965 levels.

As a result of this combined growth in home demand and foreign trade, production should rise at a rate of 8.6 %. In 1970, it may well already exceed the 1963 figure and reach 183 000 metric tons. Assuming that the Italian economy rapidly regains its long-term growth rate, crane production will be 169 000 metric tons by 1969, over 12 000 more than the 1963 peak. Output should increase at a rate of about 6 % from 1970-75, reaching 248 000 metric tons in 1975, an increase of 65 000 metric tons for the five-year period.

Continuous mechanical conveyors

The growth rate in overall demand for continuous mechanical conveyors averaged over 19 % per year from 1959 to 1963. The figures for output, home demand and foreign trade follow (in metric tons):

	1959	1963	Average annual rate
Production	17 000	30 000	15.2 %
Imports	1 291	7 077	50.0 %
less : Exports	577	1 936	35.3 %
Home demand	17 714	35 141	18.7 %

The sharp increase in home and foreign demand was not completely covered by output, and imports, rising by a factor of 6, filled the gap. Demand from the iron and steel sector due to the heavy investments in 1963 and 1964 affected both output and imports.

In 1963, the total output of continuous mechanical conveyors breaks down by type as follows:

	Metric tons	%
Chain	10 000	33.0
Belt	8 000	27.0
Roller	6 400	21.0
Other	5 600	19.0
Total	30 000	100.0

As already stated, since the manufacture of non-mass produced conveyors is of interest in setting up a new unit of the type projected, the market for belt conveyors is particularly important. Roller conveyors are mass produced in Italy by some medium-sized firms; the small proportion of these which are not mass produced owing to their characteristics is based on patents acquired from other existing factories. There are particular design requirements for chain conveyors, and their construction may be considered mainly as the assembly of parts normally available on the market. Most of the other conveyors are types used in special plants (bottling, packing, etc.), and their users are not included amongst the clientèle for whom the projected unit will cater; in fact, for non-mass produced belt conveyors, the clientèle generally coincides with that for cranes.

Market figures for non-mass produced belt conveyors in 1963 were:

	Metric tons
Production	8 000
Imports	7 100
Exports	—
Home demand	15 100

Over 1/4 of the output and practically all the imports for 1963 went to the iron and steel industry for the reasons already mentioned in connection with cranes. Demand in other sectors made up only 40 % of the total home demand. Furthermore, owing to their applications, most of the imports were of non-mass produced types.

For 1965 an average reduction of about 35 % in demand as compared with the 1963 peak is expected for all the user sectors, other than iron and steel, whose demand will evidently be down by more than half as a result of the recession and the completion of the expansion programme already referred to. In that year, imports of belt conveyors should be down to negligible levels, whilst exports should be about 500 metric tons. It is estimated that the national output of belt conveyors will be 6 000 metric tons, 1/4 down on 1963.

The largest Italian factories supplying belt conveyors are in the North. The two largest manufacturers each have a capacity of 2 000 metric tons/year and have German and American licences; they also make industrial plant and one of them also produces other lifting equipment. These factories account for half of national capacity. There are also a few dozen small and medium sized factories making belt conveyors together with other types of conveyors or lifting equipment; the output of belt conveyors of each of these factories is far below 1 000 metric tons/year. The larger representatives of the medium sized factories also have American, German and French licences.

Non-mass produced belt conveyors are sold in much the same way as cranes.

Selling prices are roughly equal all over Italy; differential transport costs are not charged for delivery in different regions, and the manufacturer usually pays for transport.

The selling prices of non-mass produced belt conveyors vary, according to type and specifications, between 350 and 800 lire/kg. It is hard to establish an average with such a range, but a rough figure might be 550 lire/kg.

Transport costs for factories in the industrial triangle for delivery in Central and Northern Italy work out at an average of 4-6 lire/kg; for the mainland of the Mezzogiorno, they are 9-14 lire/kg.

For exports to non-member countries of the EEC benefiting from premiums and refunds of indirect taxes (turnover tax - IGE), the fob prices, depending on the type and specification, are from 300 to 730 lire/kg; an average might be 470 lire/kg. Overseas shipments require packing, which costs 2.5-3 lire/kg. Packing and transport from factories in the "industrial triangle" to the port of embarkation together cost 8 lire/kg, as against 5 lire/kg for factories close to a port.

For the purposes of forecasting (see Table 4.1.8 - LVIII), a "normal" level of home demand for belt conveyors in general has been estimated at 6 000 metric tons for 1965; taking account of the estimated actual volume of exports, this gives a "normal" output of 6 500 metric tons (estimated actual demand and output in 1965: 5 500 and 6 000 metric tons respectively). As will be seen, the "normal" levels of the base year are intended to reflect a change in the structure of supply and demand as compared with

trends in previous years and they are considerably below the levels attained in 1963.

The 1975 forecasts for home demand for belt conveyors for the iron and steel industry are based on an average annual growth rate of 8 %. A rate of 7 % has been assumed for home demand from thermal power stations (transport of coal); for demand for cement manufacture and industries producing building materials (transport of sand, etc.) and other user sectors, such as salt pans, etc., the rates assumed vary from 3 % to 5 %. Finally, for home demand for conveyors for the industrial storage of other raw materials (oil seed, etc.) and certain types of distribution (cereals, etc.) rates of about 15 % have been assumed for 1965-70 and 10 % for 1970-75.

In all, home demand for belt conveyors should grow in the next ten years at an average rate of 6-7 % (as against about 20 % for the years before 1963). These forecasts are based on conservative estimates, and it should be remembered that demand from the iron and steel sector might be considerably higher and might also be concentrated within a few years in the period concerned.

The absolute level of internal demand in 1975 (11 350 metric tons) should, on account of the restricting factors mentioned, still be below the 1963 peak, whereas, as imported products tend to be replaced by national ones, the national output should be 10 000 metric tons in 1970 (1963: 8 000) and up to 14 000 in 1975 (see Table 4.1.8. - LVIII).

Thus there will be an increase in production in 1970 of nearly 2 000 metric tons as against 1963 and a further 4 000 metric tons in 1970-75. Since non-mass produced belt conveyors accounted in the base year for over 60 % of all belt conveyors, and since there are better prospects for the production and sale of non-mass produced types, the above increases for this type should be over 1 300 and 2 600 metric tons respectively in the periods with which we are concerned.

Note that exports of belt conveyors in general will absorb 8 % of output in 1965 and over 15 % in 1970 and 1975; they will go practically exclusively to countries in the process of industrialization and to Eastern countries.

However, if home demand by the iron and steel sector is concentrated in a few years in the period under examination, it may be necessary to have recourse to imports in those years.

Market on which the new unit can count and its size

On the basis of forecasts of supply and demand and the conditions applying to them over the next 10 years, we have calculated the sales which might be achieved by a large new factory to be set up in the Mezzogiorno for the construction of non-mass produced cranes and conveyors, and hence its output.

The "normal" output and the distribution between home sales and sales abroad, in metric tons/year, works out as follows:

	Home market	Exports	Total output
Bridge cranes	6 100	2 800	8 900
Dockside cranes	1 200	300	1 500
Total cranes	7 300	3 100	10 400
Belt conveyors	500	500	1 000
Total	7 800	3 600	11 400

The figure for cranes excludes those for use in building and thus refers to non-mass produced cranes used for handling and having a capacity of over 50 metric tons and cranes for continuous heavy duty service of not less than 10 metric tons capacity; the non-mass produced belt conveyors would have a belt width of not less than 500 mm. The outputs quoted include spare parts.

If the projected unit is to be successful on both the home and external markets, it will have to be an offshoot of a firm operating in its field having long design and production experience and must have licences from foreign firms of international standing. Its output may thus be highly specialized. On account of its level of production and its operating characteristics, the unit will be one of the most qualified Italian manufacturers of lifting equipment of the type under consideration, for which, in contrast to mass produced cranes and conveyors, the number of competitors on the Italian market is limited.

Only on the above conditions will it be relatively easy for the unit to achieve its intended production objectives after it begins "normal" production in 1970, when the national output of cranes will be 27 000 metric tons more than in 1963 and that of belt conveyors 2 000 metric tons, whilst home demand for this equipment will, on the whole, still be below that of the reference year. A new large factory with the characteristics of the one projected should, together with existing factories, meet much of the demand from the large iron and steel works, important industrial firms and services (ports, etc.).

In particular, home sales by the unit should in 1970 represent 7 % of the home demand for non-mass produced cranes (7 300 out of 105 000 metric tons) and 9 % of home demand for non-mass produced belt conveyors (500 out of 5 400 metric tons). Further, the unit's sales will represent only about half the increase in home demand in 1969-71 alone for these non-mass produced types of hoisting and transportation equipment, and only 1/4 of the increase in 1970-75. These proportions are not high in view

of the competitiveness of the projected unit, its specialization and the fact that the forecasts of home demand are based on conservative estimates, which will probably be exceeded by the actual progress of the next few years.

On account of the specialization of the new unit and the small effect of regional differences on transport costs and hence on prices, home sales can and must reach the entire home market (1). Over 1/3 of sales may be in the South.

30 % of the output of bridge cranes (2 800 metric tons), 20 % of that of dockside cranes (300 metric tons) and 50 % of that of belt conveyors (500 metric tons) may be exported to countries in the Mediterranean basin and other developing countries, as well as to Eastern countries, where the present already high export potential will tend to increase even more over the next few years. The projected unit, by the structure of its production and sales, and, in particular, by its high competitiveness and specialization, should thus contribute considerably to the increase in exports, which will consist mainly of non-mass produced cranes and conveyors.

Finally, specialization tends to enlarge the export market. Where such specialized products are concerned, although transport costs on foreign markets may amount to up to 10 % of the selling price fob or free Italian frontier, the purchaser will not regard this as an excessive economic burden.

Unit VIII

MANUFACTURE OF LIFT TRUCKS

The market for self-propelled industrial trucks in the EEC

In the market for self-propelled industrial trucks, other than mini-tractors (2), lift trucks predominate in both quality and prospects, accounting for 80 % of the value of output and trade. On a Community level, it is not statistically possible to separate lift trucks from the group of self-propelled trucks as a whole, although the former predominate sufficiently for the overall figures to be used to evaluate their market.

Table 4.1.8. - LIX summarizes the position and development of the market in the EEC and in the member countries for self-propelled industrial trucks in 1959-63. There are no figures for components but only for numbers of complete trucks.

(1) The average incidence of transport costs for cranes and conveyors for units in the "industrial triangle" is 1 % for deliveries in Central and Northern Italy and 2 % for deliveries in the Mezzogiorno.

(2) This group includes all trucks powered by any kind of engine or motor (electric, diesel, petrol), with or without means of lifting. It thus covers all types and models of lift, trucks, with or without special equipment, high or low lift, platform type, fork lift trucks, etc., and motorized carrier trucks without means of lifting, manually steered, platform type, etc.

In particular, the production figures for trucks, in principle, include the assembly of mainly imported parts, which is very important in some member countries. Components are excluded from the figures so as to avoid duplication and confusion of principal activities (production of mechanical components and/or assembly of trucks) with intermediate activities (manufacture of assemblies and accessories for trucks). It is true that this distinction is not adequate, as regards spares produced by principal units, for complete determination of the quantities produced; but it is sufficient to bear in mind that spares represent less than 10 % of total output.

It is also acknowledged that an analysis of output and trade by quantities only cannot be exhaustive owing to the wide range of trucks with varying weights, capacities, power units, characteristics and miscellaneous features. Moreover, where production statistics are available for member countries, as in France and Italy, these are expressed in numbers only, apart from value, and are not therefore easily comparable. In other countries (Federal Republic of Germany, Netherlands), direct estimates have been made on the basis of information furnished by large manufacturers. Where statistics on foreign trade—which represents only a fraction of the overall market supply and demand—relate to trucks alone (excluding components) some member countries give figures for value and numbers, others for value and weight. It has therefore been necessary to convert the figures by means of averages and other adjustments.

Despite the limitations of the above methods of recording, estimating and adjusting the relevant figures, the market summary in the Table mentioned is adequate as a rough illustration of the levels of production and trade in the Community, as described below.

In 1959-63 the market for self-propelled industrial trucks in the EEC as a whole grew at a rate of nearly 15 % per year. Internal demand increased at about the same rate, as also did output. Trade with the rest of the world expanded, with a certain equilibrium between imports and exports, at rates of 8-10 %.

In 1963, internal demand in the EEC as a whole was 38 000 trucks; output was 42 000; exports were over 5 000 and imports about 2 000.

In particular, internal demand in France, the Federal Republic of Germany and Italy—which had increased at roughly the same rate (15-18 %)—comprised about 90 % of the total demand in the EEC. These countries contributed about the same amount to the output of the EEC. The largest producer was Germany, with 22 000 trucks (half the output of the EEC), followed by France with 12 000, and, some distance behind, by Italy. The rate of growth of output in these countries was also roughly equal (13 % - 16 %) to that of the Community as a whole. The rate for the Netherlands was lower and that for Belgium and

Luxembourg was higher (in Belgium and Luxembourg most of the output was from assembly work) (1).

Over half the EEC's exports to non-member countries went to EFTA countries (Austria, Switzerland, Sweden, UK, etc.), 13 % to Mediterranean countries (Spain, Turkey, Greece, Egypt, Morocco, etc.), 13 % to various African countries (half of this amount to South Africa), 12 % to the Americas (half to N. America and half to Latin America, especially Chile and Mexico). The remaining sales to non-member countries went to Asia and E. Europe. Note that among the exports to the developing countries, the most important lift trucks were large capacity types used in ports and in moving timber, etc.

Nearly 50 % of the EEC's imports came from EFTA countries (UK, Denmark, Switzerland, etc., in that order), 46 % from the USA and the rest from miscellaneous countries, including Japan.

Trade within the EEC rose sharply in the period under examination, at an annual rate of over 50 %, as against 9 % for trade with non-member countries. This represented transactions involving about 5 000 trucks; Germany had by far the largest excess of exports over imports within the EEC.

Output and demand continued to expand at considerable rates, of the order of 9-10 %, in 1964-65, rather less than in 1959-63, especially in certain countries, such as Italy, where there was a recession. At present, the largest manufacturers of lift trucks in the EEC turn out some 5 000-6 000 vehicles/year. There is one factory of this size in the Federal Republic and another in France. At least 3 more factories, producing slightly less, operate in these countries, and there are more than 10 in the EEC producing 1 000-3 000 trucks/year, of which only one is in Italy. According to analyses effected for the purposes of the present study, a factory would require a minimum annual output of 1 500-2 000 trucks in order to compete technically and economically on a Community and international scale. Only at this level does production based on medium runs become possible, with satisfactory productional features such as studywork, experience, techniques, etc.; only at this level can a factory operate commercially, financially and on a supplies basis similar to the conditions enjoyed by the largest factories.

According to forecasts of internal demand in the EEC based on medium and long term trends in the industrial user sectors and services, internal demand in the EEC is likely to grow at a rate of 9 % per year up to 1970 and 8 % up to 1975; in 1970 it will exceed 70 000 and in 1975 105 000 trucks. Taking account also of trends in trade with non-member countries, the output of the EEC is likely to increase, as compared with 1965, by at least 26 000 trucks in 1970 and by a further 35 000 in 1975. These increases, referred specifically to lift trucks of all types and models, will be 20 000 and 30 000 respectively.

The market for self-propelled industrial trucks in Italy, with particular reference to lift trucks

We continue the general examination of the EEC market figures for self-propelled trucks from the Italian point of view, going into further detail with respect to certain aspects and concentrating on lift trucks. The figures quoted here are derived, apart from the sources already mentioned, from a direct survey of various manufacturers (it was not possible to cover all of them). This means that the analyses and the results have their limitations; in practice, these affect not so much determination of the structure and situation of the market at present as its structure and situation in the past, i.e. at the beginning of the period with which we are concerned.

As we have seen, the market for self-propelled industrial trucks in Italy increased in 1959-63 at an annual rate of over 22 %. Apparent internal demand grew by 18 % and exports, starting at a negligible level, trebled in those years. The domestic supply, i.e. output, rose at a rate of 15 %, a high rate, but nevertheless lower than that of total demand; consequently, more and more recourse was had to imports, which increased at a rate of over 60 % (in 1963 they accounted for 1/3 of the home market).

In terms of absolute numbers, production was 3 800 trucks (8 700 metric tons) in 1963, exports less than 800 and imports about 1 500. Apparent home demand was about 4 500 trucks (10 600 metric tons). Taking account of the accumulation of stocks that began towards the end of 1963, net internal demand was under 4 200 trucks (9 700 metric tons) (2). In fact, the actual annual rate of expansion of home demand in the period would appear to be less than that stated above, amounting to 16 % (see Table 4.1.8.-LX).

60 % of Italian imports came from EEC countries, mainly (2/3) from the Federal Republic of Germany, 20 % from EFTA countries, mainly Denmark and the UK, and the remainder practically all from the USA. Apart from importing about 3 600 metric tons of trucks, Italy in the same year imported about 200 metric tons of spares, rather less than 5 % of the total. Over 50 % of exports (3) went to other member countries of the EEC, especially France and

(1) Belgium also seems to have produced large quantities of accessories for trucks, which were exported to factories producing trucks in other member countries.

(2) The terms "net" or "apparent" demand are used depending on whether variations in stocks are taken into account or not.

(3) The absolute figures for numbers and weight of trucks exported in 1963 referred to in this study do not coincide with the official provisional figures, since we have made adjustments on the basis of the direct survey of manufacturers. These discrepancies are also due to the system of compiling and classifying customs statistics (trucks, spare parts, etc.).

Germany, 20 % went to EFTA countries, 18 % to Mediterranean countries and the rest to various African, Latin American and Asian countries.

The Italian market for self-propelled industrial trucks was hard hit by the recession of 1964-65. Home demand fell by 1/4 from the 1963 peak (after some years of strong expansionary trends). From about 4 500 trucks, home demand is estimated to have dropped to 3 200 in 1965.

The truck-building sector reacted sharply to this contraction, in prices, commercial organization, etc. It doubled exports in two years, whilst imports were halved in comparison with 1963. In this way it was possible te keep the fall in output to a little more than 10 %, even with the absorption of stocks which had accumulated in 1964. 1965 output is estimated at 3 400 trucks (1963: 3 800). 400 metric tons of spares, etc., should be added to these production figures.

More specifically, lift trucks of 600 kg to 3 metric tons capacity (1) represented nearly 80 % by number of the total home demand for self-propelled industrial trucks in 1963. 3 300 units were sold on the Italian market in that year. It is estimated that 65 % of this demand was "new" and 35 % replacement demand. The user sectors from which the demand originated were industry (84 %) and services (16 %); 70 % of the demand was from Central and Northern Italy and 30 % from the Mezzogiorno. At the end of 1963, the number of lift trucks in use (2) was estimated at 14 000, of which 86 % were in use in industry (about 1/2 in the metal/mechanical engineering industry) and 14 % in services. About 700 lift trucks were exported and about 1 100 imported. Output reached 3 300 units, although 1/10 of these were added to stocks (see Table 4.1.8. - LXI).

In 1964 and 1965 home demand fell to 2 900 and 2 800 lift trucks respectively (1963 : 3 300). The export drive and the replacement of imported trucks by Italian made ones—exports rose to 1 200 units in 1965, whilst imports fell to 600—partly compensated for the fall in home demand. Despite the partial absorption of stocks accumulated at the end of 1963 and in the whole of 1964, production fell only to 3 000 units. In the final months of 1965 there were signs of a revival in home demand and hence of a higher rate of output.

The lift truck sector in Italy at present comprises one large manufacturer producing 2 000 trucks (diesel, petrol and electric) per year, some 2/3 of the national output (3). In addition to trucks, the factory produces mechanical assemblies for industrial vehicles. There follow 5 more factories with annual rates of production of 300-400 trucks, which mostly also produce other mechanical units; one of these, apparently, has recently switched from the assembly of imported components to the manufacture of mechanical parts. About 10 more smaller units mainly assemble parts imported from other countries (USA, etc.). None of these factories is in the Mezzogiorno.

The distribution by size of the factories in the sector shows that in actual fact there is only one lift truck factory capable of competing economically at Community level and on the international market. However, in view of future growth in demand, a few factories in the first group have expansion plans: productive structures are to be developed and/or there will be 2 shifts per day instead of one. Hence the "normal" output of the sector could rise from 3 600 to 5 000 units in the next few years.

At present, lift trucks are distributed through branches. Distribution on a national level would require about ten branches with their own staff and/or sole agents. Stocks at branches are limited to those needed for display and demonstration purposes and to trucks lent out for use while customers' trucks are under repair.

The sales policy followed by the most important manufacturers and distributors means that list prices are the same for each type and model of a given make throughout the home market; normally, packing and carriage costs are absorbed by the manufacturer (or distributor, in the case of imported trucks). The selling prices, i.e. the sum obtained per unit by the manufacturers, are usually 12-15 % below list, this percentage covering discounts, commission and direct overheads of the branches, including a year's guarantee service.

The average list price of a diesel lift truck with a capacity of 1.2 metric tons, of a normal type, is about 2.35-2.45 million lire for the best known makes. The selling price works out at about 2 million lire per vehicle, i.e. 830-850 000 lire per metric ton. Transport costs for delivery by lorry from a factory in the Milan area to Central and Northern Italy are about 10 000 lire/metric ton, and to the mainland of the Mezzogiorno 14 000 lire/metric ton (including anchoring blocks, etc.); transport by rail free to frontier for exports to Central Europe work out at a total of some 7 000 lire/metric ton.

For overseas sales, with an export premium of 35 lire/kg and a refund of the 6.6 % turnover tax (IGE), the selling price may fall to 700 000 lire/metric ton, excluding shipping costs. Transport costs, including packing (wooden case), from the Milan area fob port of embarkation, work out at 33 000 lire/metric ton. As a result of the cost of this special packing, the cost of shipment fob for a factory in the vicinity of a port would still normally be over 29 000 lire/metric ton.

(1) Lift trucks of the capacities stated, of miscellaneous types, propelled by electric motor or diesel or petrol engines, with or without special equipment, high or low lift, etc.
(2) In the remainder of the text, the term "lift trucks" refers only to those with capacities between 600 kg and 3 metric tons, except where otherwise stated.
(3) In 1959 the output of the largest Italian factory was about 1 000 trucks/year.

In general, the prices charged by Italian manufacturers in recent years on the home and international markets have been competitive; this is borne out by the growth in exports. On the other hand, it should be remembered that most of this growth is attributable to the large Italian factory which manufactures on a European scale; for smaller factories, export prices would involve appreciably lower profit margins.

Table 4.1.8. - LXI gives the forecasts of supply and demand in Italy for 1970 and 1975. The forecasts of internal demand are based on the anticipated growth of replacement and "new" demand, the latter being represented by net investments increasing the numbers in use. Replacement demand has been worked out on the basis of a series of past sales on the Italian market, assuming that the average life of a lift truck is 7 years for trucks produced up to 1970 and 6 years for those produced in 1970-75 (1).

"New" demand has been estimated assuming a revival of activity in the industrial sectors, which, starting, in general, from a level 25 % below the 1963 peak, is assumed to be growing at a rate of 6 %. New investment in lift trucks in 1966 is also assumed to be 25 % down on 1963, but increasing at a rate of 8 % up to 1970. This rate reflects the tendency in many industries to use internal factory and warehouse transport facilities to an increasing extent in order to save manpower and reduce materials handling times. This rate also allows for the increased use of these trucks due to the increased output of factories; this increase in output is a result of the increasing pressure of national and international competition. In the mechanical engineering sector in particular, and in other sectors, this increased use, depending on the size of the factory and on mass production, tends to reach a saturation level, above which a proportion of the lift trucks are replaced by special means of transportation (overhead and miscellaneous conveyors, etc.). This factor has been taken into account in the forecast of "new" demand in 1970-75, where the annual rate of growth in lift trucks is assumed to be down from 8 to 7 %.

Although activity in the user sectors in the service industries is expected to increase at an average rate of 4-5 % (more than the rate for service industries as a whole), their "new" net investment demand for lift trucks is expected to rise at a rate of 10 % up to 1970 and 9 % up to 1975, starting from a level 15 % below the 1963 peak (2).

The forecasts given in Table 4.1.8. - LXI, although derived from deliberately conservative estimates, show that the number of lift trucks of 600 kg to 3 metric tons capacity in use in 1970 should reach 27 000; by 1975 it will exceed 41 000. The distribution between industries and services shows that the importance of the latter will increase (18 %) although industrial use will remain predominant (82 %). In 1970, home demand will amount to 5 400 trucks and in 1975 to 8 500. The increase in sales on the home market will be due increasingly to replacement demand, which will account for 60 % in 1975 (less than 40 % will then consist of net investment for increasing the total number of trucks in use). Regionally, home demand will continue to be concentrated in Central and Northern Italy (nearly 2/3), whilst a little more than 1/3 will originate from the Mezzogiorno; the proportion of sales in the Mezzogiorno will, however, be higher than in the preceding period.

According to the figures given, internal demand will increase, as compared with the 1963 peak, by over 2 000 lift trucks up to 1970 and by over 3 000 from 1970-75; the corresponding figures for the Mezzogiorno are 800 and 1 200 respectively.

It has been assumed that exports will rise at a rate of about 10 % per year, in itself a high rate, but still far below past and recent trends. This rate takes account of the trading policies of the largest Italian manufacturers and of the concrete export prospects for the EEC, the Mediterranean countries and other developing countries. On the other hand, despite strong trends towards the replacement of imports by home produced trucks, the former are expected to be considerably greater in 1975 than in 1963; on this hypothesis, imports will increase by 6 % from 1965-70 and another 8 % from 1970-75. At this rate, net exports in 1975 could reach 2 000 units.

To sum up, as a result of home demand and net external demand, Italian output of lift trucks in 1970 should be twice that of 1963, reaching 6 000-7 000 trucks, and rising to 10 000-11 000 in 1975. The net increase in the production of the sector up to 1970 should thus exceed 3 000 trucks, with a further increase of 3 000-4 000 trucks from 1970-75, an average annual rate of increase of 10 % over the entire period considered.

There is no doubt that most of the growth in demand and production of self-propelled industrial trucks will be in the field of lift trucks of the capacities mentioned and of those with internal combustion engines (diesel and petrol), which, although they require more maintenance than electric types, are faster and can be used on a more continuous basis when more than one shift is worked.

Market on which the new unit can count and the size of the unit

Considering the potential expansion of supply and demand on the market and the high anticipated degree of competitiveness, the output of the factory could be 5 600 metric tons of lift trucks, split up as follows:

(1) The series of sales taken as a basis, with a time lag of 7-6 years, to determine replacement demand, was adjusted by means of 3 year shifting averages.

(2) The combined rate of "new" home demand for all the user sectors (industries and services) in Table 4.1.8.-LXI, referred to the period 1965-70, is greater than the above rates, as the 1965 levels were still depressed by the recession.

	Home market			Exports	Total output	
	Total	Central-Northern Italy	Mezzo-giorno		units	(metric tons)
	units					
Lift trucks:						
Capacity 1.2 metric tons	810	435	375	390	1 200	2 880
Capacity 2 m. tons	340	185	155	160	500	1 650
Capacity 3 m. tons	150	80	70	70	220	1 070
Total	1 300	700	600	620	1 920	5 600

The above output and sales figures, for "normal" activity, apply to lift trucks with internal combustion engines. The 3 basic types, both diesel and petrol driven, with cushion or pneumatic tyres, would have lifts variable from 3-5 m. The above figures include 7-8 % spare parts.

The projected factory will be on a scale such that its output is the same as that of the present largest Italian manufacturer. Even if some of the existing factories are enlarged, the projected factory will certainly be one of the largest producers, and will be one of the few Italian firms large enough to be competitive internationally. In addition to having a local network of auxiliary and subsidiary units, as with competing firms in Northern and Central Italy (and even highly specialized units producing gears and drawn products on a mass production basis, which are lacking in those industrial areas) and to having an advanced design organization, the factory will possess certain commercial advantages due to its location in the Mezzogiorno, by virtue of the laws pertaining to the development of these regions. The unit will probably be the only large factory operating in the South at the time, and it will offer low prices and high quality, enabling purchasers of undertakings in the Mezzogiorno to benefit from increased contributions from the Cassa per il Mezzogiorno (1).

The output of the projected unit up to 1970-75 should be about 1/4 of total Italian output of lift trucks, but in view of the present actual capacity of existing factories in the sector and of planned extensions, there will by 1970 already be a margin of about 1 500 units for a new factory. Disregarding this margin, the prospects of expanding output in 1970-75 mean that the output of the new factory would account for rather less than half of the foreseeable increases.

One of the aims of the projected factory will be to sell a constant proportion of its output on foreign markets (30-35 %), about half of which will go to EEC and EFTA countries and the other half to Mediterranean and overseas countries in general.

On the home market, sales by the unit will be equal to the increase in home demand of only 2 years between 1970 and 1975. As regards the regional distribution of sales, in view of the role of the factory and the conditions and advantages mentioned, this unit could meet 1/3 of the demand of the Mezzogiorno and 1/5 of that of Central and Northern Italy.

(1) For the construction of new industrial plants and the expansion of existing installations, grants of up to 20 % for machinery and other fixed assets specified by the law are made. These grants may be up to 30 % as regards the cost of machinery and other equipment constructed by industries in the South.

4.2. SELECTION OF INTERMEDIARY INDUSTRIES AND EXAMINATION OF COHERENCE OF THE WHOLE

4.2.1. LIST (AND DESCRIPTION) OF INTERMEDIARY MECHANICAL ENGINEERING INDUSTRIES.

The activity of the processing industries is based on inputs from other industries (among the manufacturing industries themselves and other sectors) and other economic activities. Here the object is to list only those industries that produce to satisfy this intermediate engineering demand—a complex subject—and not to deal with "industrial services" such as methods and production equipment design offices, exploded

assembly drawing offices (1), plan reproduction services and other technical offices which, moreover (see 4.2.4.) are not considered to need direct promotion, since they may be assumed to come into being with the development of the pole.

More specifically, in this report, "main" or "final" industries are those that produce for final demand, whether it be capital or consumer goods. All other industries are defined as intermediary (in mechanical engineering the distinction between main and intermediary is not always clearcut; in some cases, as will be seen in what follows, it has been drawn on a conventional basis to meet the needs of this report). In general, intermediary units produce to provide inputs for the main units. But there is a considerable two-way traffic between various types of intermediary unit; some of them may even be considered as complementary to others (eg. units that weld for toolmaking shops).

The intermediary units concerned are those belonging to the processing industries. The analysis does not include industries associated with the production and/or distribution of electricity, gas and water since it is evident that the mechanical engineering industry as a whole draws on them. For similar reasons, units involved in the production of primary processing of ferrous and non-ferrous metals have been excluded from primary processing industries; under the present terms of reference, they form a separate group called "primary units" and, moreover, are very little affected by location problems, as compared with the main units.

The study of intermediary units belonging to processing industries was finally restricted to those that supply production and maintenance inputs. Consequently those producing factory supplies and other products and materials not incorporated in the finished product are not considered. Here again this is due to the fact that such materials are known, *a priori,* to be in very general use throughout the main engineering industries.

The structure and characteristics of the intermediary units to which the following analysis relates, are those prevailing in the most highly industrialized areas of the EEC where there is a high degree of specialization in production activity. It should be noted in this context that it was not considered sufficient to refer merely to the structure and characteristics obtaining in northern Italy where some types of intermediary unit found in the great industrial centres in other countries are practically non-existent.

The NICE was found to be too condensed for use as a nomenclature for the intermediate units. The Italconsult nomenclature already used in earlier studies in the mechanical engineering field (2) was therefore employed. It has the advantage of satisfying location criteria and requirements arising from the interrelation between industries. This nomenclature divides intermediary units into "auxiliary", "subsidiary" and "other intermediary units". These intermediary units have to satisfy the widely differing and separate requirements of the main units as regards output and location. As will be seen subsequently in more detail "auxiliary" units have the task of maintaining the efficiency of the production equipment of the main units; the "subsidiary" units contribute directly to the main units' production by providing finished blanks and by processing parts made or executed to the latter's specification; "other intermediary units", on the other hand, supply trade or standard products. In view of these differing types of output, the main units, for technical and economic reasons, need to have frequent contact with the first two groups of intermediary unit which therefore have to be close at hand. For the third group, except in certain limited cases, ("new" products, etc.) this need for contact does not, as a rule, apply and client industries require local stocks rather than manufacturing works.

The following is a brief description of the intermediary units by group, class and type of facilities together with some general information on their relations with the main units and with each other.

AUXILIARY UNITS

The auxiliary units are exclusively concerned with tooling and maintaining the production apparatus of other units (machinery, jigs and tools, plant). They comprise "toolmaking", pattern-making units, "maintenance and service" units and their "complementary" units.

"Tool-making shops" are specialized engineering workshops which supply, repair and modify, to the order of main and intermediary units, the jigs and

(1) At the request of industrial clients, methods bureaux work out production methods for a product (or for a group forming part of it) and devise production schedules for component parts covering the making of castings, forgings and cold pressings, machining, assembly, fitting and testing; they estimate processing times and requirement of labour, machinery and special plant. The services of methods bureaux are usually called upon by medium-small units; large and medium units meet the requirement internally from their own resources. Equipment design offices design tools and jigs, machines and special plant, on the basis of production schedules, operation charts and process plans. Medium and small units call on the services of these offices regularly but large units use them as well for peak requirements, i.e. when their own staff cannot cope. These methods and design offices often operate as sections of the same concern; it should be noted however that there is considerable specialization in the various fields concerned (casting, forging, stamping, presswork, machining, special plant, etc.) Exploded-assembly drawing offices execute special drawings, at the request of main industries, for use in catalogues, operating instructions and maintenance booklets for their products.

(1) Various mechanical engineering sectors, not including motor manufacture, aircraft construction and shipbuilding.

tools used by those units to carry out specific operations on the parts that constitute their products, as well as special gauges and instruments.

It will be seen that tool-making shops have the special function of maintaining certain production equipment (repairs and modifications to jigs and tools) as well as making such equipment (original equipment and replacement).

Jigs and tools serve to locate production parts on the machines working them both in order to reduce working time, and therefore costs, and also to guarantee that the parts themselves all have the same measurements. Without jigs and tools the making of the parts would become very costly, apart from requiring the employment of skilled labour (production machinery fitted with the appropriate jigs and tools generally enables unskilled labour to be used, i.e. machine operators of grade 3: ordinary operatives).

Tool-making shops subdivide into metal-removing tool shops, assembly tool shops and metal-forming tool shops.

Metal-removing tool shops produce jigs and tools for use in producing parts by the removal of metal. These workshops sub-divide into large, medium and small.

The *large* category comprises workshops having machinery suitable for making jigs and tools of considerable size and high constructional precision for general or so-called "universal" machines (boring tools, large tools of cast-iron construction, etc.). They handle the repair, modification and replacement not only of this equipment but also of that incorporated in special machinery (multiple head machines, transfers, etc.). Modifications to tools on these latter machines are limited to those which do not involve alterations to the structure of the machines themselves (1).

The *medium* group are workshops having machinery suitable for making jigs and tools of medium size and, where necessary, requiring a certain degree of constructional precision (milling, drilling and lathe tools; gear-cutting chucks, grinding chucks, moulds for casting non-ferrous material, etc.). In the large industrial concentrations there are tool-making shops organized for the construction, modification and repair of both large and medium jigs and tools with special machinery.

Small metal-removing tool shops comprise workshops making jigs and tools of small size or requiring medium constructional precision (lathe tool-holders; small drilling, milling and lathe tools, etc.). These workshop can also repair and make special gauges and instruments.

Assembly tool shops make jigs and tools enabling main units to join parts by welding or to assemble groups of components forming a part of a product manufactured by the main units. These workshops can thus produce tools for either welding or assembling.

The first category comprises workshops with the necessary plant to make jigs and tools for assembling various parts that have to be joined together by welding (spot, projection, oxy-acetylene, arc, etc.) in order to obtain groups or sub-groups forming part of a given product. These workshops also supply jigs and tools for auxiliary and subsidiary iron and steel foundries. All this type of tooling requires limited constructional precision; it is not used on machine tools but on the bench, turntable, etc., as well as on special foundry plant, as mentioned.

The second category comprises workshops set up for the making of jigs and tools intended for the assembly of sub-groups, groups and complete assemblies. Like the previous type, this kind of equipment obviously is not used on machine tools. In practice there are also units which make and repair jigs and tools for both welding and assembly; there are not infrequent cases of units of this type also supplying small-scale jigs and tools for machining, i.e. special small-scale metal-removing tools.

Metal-forming tool shops make and repair metal-forming tools for making standard parts by metal-forming, cold (pressing) or hot (stamping, chill casting, etc.).

These workshops comprise large, medium, small and special. As in the case of metal-removing tool shops, these terms refer not to the productive capacity of the unit concerned but to the size of the equipment produced.

Large metal-forming tool shops are workshops having machinery for producing tools of substantial size and particular constructional precision, eg: motor-car body dies, metal bath-tub dies, etc.

Medium tool-making shops have machinery for producing tools of medium size and constructional precision: dies for medium size pressings, dies for blanks, chills, etc. As well as being equipped to make medium-size metal-forming tools these mills can also handle repairs on metal-forming tools (not construction).

The *small* class consists of workshops with machinery for producing small tools requiring medium constructional precision: bending dies, trimming dies, dies for forming small parts, etc. However, some medium-small metal-forming tool shops not only make and repair this class of tools but can also undertake the maintenance of large metal-forming tools. In fact a combined medium—small tool-making shop can economically use machinery that is common to the two grades of work mentioned.

Finally, *special* metal forming tool shops are equipped with machinery for producing die-moulds, sometimes of compound type, from conglomorate, for the manufacture of laminated magnetic cores for electric motors, etc.

(1) Work of this nature must be given to the manufacturers of the special machinery.

"Pattern-making units" supply patterns for sand moulds to the order of auxiliary and subsidiary foundries. Where castings are required in medium or small series the latter may, according to circumstances, make their own patterns.

Pattern-making units divide up into large and medium-small according to the size of the patterns they make. These units are tending more and more to become complementary sections of foundries.

"Maintenance and service units" are specialized engineering workshops which supply services and do assembly work at the request of the main and intermediary units (which generally provide the necessary materials) in order to maintain the efficiency of plant, machinery and miscellaneous equipment at those units. This work is generally referred to as maintenance and service.

In general, maintenance operations are partly executed by the main and intermediary units themselves (1); this internal maintenance normally relates to situations requiring immediate attention. Operations carried out by the specialized units in question, or external maintenance, are those of a non-routine nature and periodic overhauls. Periodic overhaul of plant occurs preferentially during the seasonal shut-downs of the main units (summer and winter); in the meantime the maintenance and service units, apart from non-routine maintenance and repair work, make the advance arrangements necessary for overhaul work (inspections, preparation of materials, etc.). Periodic overhaul of machinery occurs at variable intervals, according to type.

Maintenance and servicing covers plant, production machines, transport and storage equipment. These services are carried out by units specializing in the various types of capital equipment. In some industrial centres where the demand for such services is relatively limited, there are also combined units for the overhaul of plant and various types of machinery; but the maintenance and servicing of transport (motor vehicle engineering workshops) and the maintenance of storage equipment (small firms making light metalwork etc.), always remain separate.

The most highly specialized maintenance and service units found in the biggest industrial concentrations have the following functions:

Maintenance and service units for plant and buildings keep plant of a general nature (heat and electricity generating plant, water supply plant, with the associated distribution systems, etc.) and special plant (for painting, heat treatment and electro-plating, etc.) in working order. These units can also carry out repairs to various industrial buildings.

(1) Some auxiliary and subsidiary units, on the other hand, are tending, due to their special production organization, towards a certain degree of self-sufficiency in relation to their own maintenance needs, eg. rod-making shops, foundries, etc.

Maintenance and service units for electric machines deal with purely electrical machinery or welding equipment (fixed, portable, overhead welders, etc.) and heat treatment equipment (electronic heaters, induction hardening furnaces, etc.)

Maintenance and service units for electric parts of miscellaneous machinery, are concerned with electric motors, control panels, switch boards, etc.

Maintenance and service units for machine tools handle machine tools such as milling and boring machines, lathes, broaching machines, etc.

Maintenance and service units for metal-forming machinery handle machinery for mechanical forming such as mechanical and hydraulic presses, hammers, etc. and machinery for making castings.

Maintenance and service units for transport maintain lift and carrier trucks, company locomotives and rolling stock, vehicle fleets, etc.

Maintenance and service units for storage equipment are concerned with bins, trays, pallets, shelves, racks, tables, etc.

"Units complementary to tool-making shops and maintenance and service units".

For certain work, tool-making shops rely on a number of complementary units working mainly on their behalf, such as auxiliary welding and electric-plant units. Other auxiliary units such as foundries, forges and treatment shops work both for tool-making workshops and for maintenance and service units and departments (external and internal). *Pattern-making units* supply not only auxiliary foundries, defined as complementary units to tool-making workshops and maintenance units, but also subsidiary foundries (see below).

Auxiliary welding units supply blank welded groups ordered by the metal-removing, assembly and metal-forming tool shops for the construction and repair of jigs, tools and dies. *Large* and *medium* welding units produce respectively large and medium-sized welded groups. The functions of auxiliary welding units can, in practice, also be carried out by small, light metalwork firms which, with their plate and sheet cutting and welding machinery, are also capable of work normally handled by maintenance and service units for storage equipment as already noted.

Auxiliary electrical-equipment units are workshops specializing in the construction of control panels, switch boards and electrical plant used in tooling production units. This work, however, may also be adequately performed by the units already mentioned which maintain and service electrical components of various types of machinery.

Auxiliary foundries supply blank castings ordered by metal-removing and metal-forming tool shops for the making and repair of jigs and tools, hot and cold dies

and chills and also those ordered by main and intermediary units for plant and machinery maintenance.

They differ from the foundries listed among subsidiary units in that their function is that of supplying blanks that are not incorporated in products and are of a heterogeneous nature.

Such foundries, therefore, do not supply in quantity but normally execute "one-off" orders. It is important to note that, in practice, some auxiliary foundries are the sections of subsidiary foundries using plant partially common to both and offering a wider range of services to the customer.

Auxiliary foundries are divided into iron, steel and non-ferrous units according to the material used to produce the castings.

Auxiliary forges are units that supply blank stampings and forgings (made by hand) to the order of the metal-removing and forming tool shops for making and repairing jigs and tools, hot dies and chills, and of the main and intermediary units for plant and machinery maintenance.

Auxiliary forges are different from those functioning as subsidiaries of main units in that they only supply forgings of a heterogeneous nature which are not incorporated in the final product whereas the latter work more with production machinery for the production of repetition blanks which, after processing, will form parts of finished products. Auxiliary forges can also operate as sections of subsidiary forges.

Auxiliary treatment units may be for *heat* treatment (case hardening, hardening, tempering, nitriding, cyanide hardening, etc.) (1) and for *electro-plating* (copper, nickel, chromium, cadmium and zinc-plating, etc.).

Auxiliary heat-treatment activity covers the treatment of material on behalf of metal-removing and forming tool shops (parts of jigs and tools, hot and cold dies, chills, chucks, collets, bushes, etc.) and of main and intermediary units for maintenance needs.

Electro-plating, by auxiliary units, is applied to materials for metal-removing tool shops (various gear-cutting jigs and tools, etc.) and for forming tool shops (thermosetting and thermoplastics dies, etc.).

Auxiliary treatment units would thus produce work that is neither repetition work nor incorporated in the products of the main units, etc., differing in this way from subsidiary treatment units (see below). But in practice these auxiliary units are usually a section of a single heat treatment or electro-plating unit operating as both auxiliary and subsidiary (see below).

(1) Isothermal stabilization and austempering are not mentioned as they normally take place in auxiliary foundries and forges.

SUBSIDIARY UNITS
(Sub-contracted work)

Subsidiary units are undertakings whose production, in general, eventually forms part of the products of the main and intermediary units. They supply finished blanks and produce parts.

Subsidiary units are made up of foundries and forges and other units doing sub-contracted work.

"Subsidiary foundries and forges". — Subsidiary foundries supply castings for production, normally repetition work, and can be divided, according to the materials used for the castings, into the following types of foundry: grey-iron, malleable and special iron (nodular, mehanite, spheroidal, etc.), steel, non-ferrous metals, special alloys (stainless steel and various alloys).

Subsidiary forges produce repetition parts by drop-forging and make forgings on behalf of other units.

As already stated, subsidiary foundries and forges may include an auxiliary foundry or forging section, respectively.

"Other sub-contracting units". — The fields of activity of these units include machining, presswork, thermosets and thermoplastics, extrusions, sintered products, microcastings and treatments.

The use of these units, as of all intermediary units in general, is to be explained in terms of specialization and therefore lower costs. This is clearly shown by the above-mentioned foundries and forges and by the manufacture of sintered products, microcastings, etc., where the production level of even the large main units would hardly ever enable full use to be made of the special plant and machinery necessary for the work, which, however, is possible for the specialized intermediary units mentioned. At first sight these external economies are less obvious in the use of other subsidiary units such as those which do machining work, etc., units, that is, producing the same parts as those made on the same machines by the main units ordering them. In the event, the use of these intermediary units concerns work which would involve less than a full daily machine loading in the main units. In these cases, a selection is made, on the basis of machine loading, of those parts whose production means the full use of the internal machinery and those for which it is economically advisable to give the work outside (2). Sometimes, depending on the features of production cycles involving the use of

(1) In practice the use of sub-contracting units may be due to various economic factors: to limit capital investment risks (capital tied up in machinery, etc. is reduced), to achieve lower processing costs (because of lower overheads and other expenses, some small sub-contracting units, can work to prices below the actual cost of similar work in the main units), etc.

machine tools of various types, it may be advantageous to have outside units execute the initial operations on certain parts.

These subsidiary units are therefore concerned with the production of parts and various operations which main and other intermediary units consider can be more economically executed outside. It should be borne in mind that the products of these subsidiaries are specific parts of the types produced by the main units, etc. and do not include standard times commonly available on the market.

Machining units make parts for the products of other units by the removal of metal. These units are divided into: large, medium, small, precision and gear-cutting, according to the nature of their output. The large, medium and small units are so called according to the type of repetition work they do (large, medium and small series production), and/or to the size of the parts produced. Such units have different types of production apparatus. But there is, nevertheless, some use of similar machinery as between large and medium and as between medium and small machining units. In practice, mixed-level units (e.g.: large-medium machining units) are normally formed by suitable addition to production equipment.

Precision machining units supply parts that require special production equipment and staff with particular skills and aptitudes.

The gear-cutting units produce toothed components on large, medium or small series production equipment.

Presswork units undertake particular metal-forming operations required for products made by the main units (1). These also comprise large, medium, small and precision units. The production of large and medium pressing units is so termed in relation to the production equipment used and/or the quantity produced. Since these units employ machinery partly in common use, suitably organized, combined large-medium pressing units are also found in practice.

Small presswork is carried out by units clearly differentiated by their small-scale production equipment.

Precision presswork units supply parts which have to be made on special production equipment and by staff with particular skills and aptitudes.

Thermosetting and thermoplastics units produce parts obtained by the plastic deformation of various materials. They subdivide into large, medium, small and precision according to characteristics similar to those set out above for the corresponding presswork units.

Extrusion units make parts with special mechanical forming equipment, i.e. by the extrusion of ferrous and non-ferrous materials.

(1) Some intermediary units also require pressings.

Sintering units produce finished parts formed by the consolidation of powdered ferrous and non-ferrous metals through the welding action of cementing alloys (sintering) subjected to the appropriate heat treatment. The production of these parts involves the use of special plant and machinery.

Microcasting units make small finished castings of ferrous and non-ferrous metals, characterized by high constructional uniformity.

Finally *treatment* units handle the heat treatment and electroplating of parts produced by other units. *Heat* treatment units execute work such as case-hardening hardening, tempering, nitriding, cyaniding, etc., for main and intermediary units. It should be noted that these treatments are largely "intermediate work". "Primary" treatment (isothermal stabilization and austempering) is effected, for technical and economic reasons, in the subsidiary and auxiliary foundries and forges. Gear-cutting units, which need "intermediate processing" heat treatment on a large scale also have their own facilities. *Electro-plating* units do copper, nickel, chrome cadmium and zinc plating, etc.

As previously pointed out subsidiary treatment units are normally accompanied by a corresponding section providing auxiliary services. Some combined heat treatment and electro-plating units have also been encountered.

It should finally be noted that subsidiary units should also include the bolt factories supplying bolts of special sizes and types, to the order of client industries (see below).

OTHER INTERMEDIARY UNITS

Other intermediary units supply products of wide industrial use. These products are generally of a given type predetermined by the range offered by the individual suppliers producing them or by all producers at national and/or international level. Here it is convenient to term the former "trade products" and the latter "standard" products. The heading "trade products" covers, for example, hydraulic and pneumatic cylinders, valve gear, rubber extrusions, insulation, speed reducing and regulating gear, electric and hydraulic fittings, paint, etc. Standard products, on the other hand, comprise electric motors, bolts, bearings, seals and gaskets, springs, nuts, pins, washers, ring nuts, springwashers, etc.

Every product (formed by an assembly of various parts) may include component parts of this type when the design side does not specify special parts. It is clear that one object of design will be to make the greatest possible use of trade and standard parts since they are mass-produced and therefore cheaper.

In addition to inputs incorporated in the products of the units using them, the intermediary units in question also supply maintenance material.

Unlike the situation with auxiliary and subsidiary units, the following nomenclature, apart from cases like bolts, relates to given manufactures of products or groups of products rather than to actual units. This is due to the fact that the high degree of production specialization found among auxiliary and subsidiary units is not always present with the "other intermediary units"; even in the most highly industrialized areas firms active in the same field do not make the same products.

Bolt units can be classified according to whether they produce hot or cold-headed, machined or special bolts.

The *cold*-heading units supply normal medium strength bolts, cold-headed in sizes laid down by the standards governing the manufacture of bolts of wide industrial use. "*Hot*"-forged bolt units make standard, medium-strength, hot and cold-forged bolts by the most up-to-date techniques, in sizes laid down in the standards mentioned and of wide use in heavy metal structures.

Machined bolt units machine standard high-strength bolts to sizes laid down in the relevant specifications.

Finally *special* bolt units supply special-process, high and medium strength bolts, in special sizes and shapes for uses specified by the various firms ordering them. These units represent an exception in the classification adopted; this has been done so that all bolt units can be grouped together, despite the fact that, in certain respects, special bolt units have output characteristics qualifying them for inclusion among the subsidiary units.

It should be borne in mind that in many cases a single bolt unit produces machined and special bolts; this is a case of products being obtained by means of the same technique the first being standard parts and the latter being supplied on specific request for the various sizes. It is not unusual to find one firm producing all four types of bolt listed above.

Small metal goods units make the following standard parts:
— collars and washers, nuts and lock-nuts, straight and tapered pins, rivets, large and small nails; spring washers;
— terminal lugs, connectors, tags, clips, etc.

They also manufacture, as trade products:
— valve gear and small cocks and fittings.

The product groupings listed above frequently correspond to product lines of separate units.

Metal strip units produce strip in ferrous materials (plain steel, alloy steel, hot-rolled, cold-rolled, chrome, zinc, cadmium and nickel-plated, dipped, etc.) and non-ferrous materials (copper, brass, aluminium, etc.).

Seal and gasket units are workshops equipped to mass-produce special seals and gaskets (generally air, oil and other fluids) such as: O-rings, (for pistons, cylinders and other non-rotating parts of mechanical plant); seals for bearings (for shafts, spindles and other rotating elements of mechanical plant); graphite packing (for rotating elements of large size and for particular conditions of use: boilers, hydraulic pumps, etc.).

Spring manufacturing units supply springs of various types for all industrial purposes, such as: semi-elliptic springs (for front and rear suspension of wheeled vehicles), spiral and helicoidal springs (extension and compression, for mechanical structures of all types).

Radiator units mass-produce radiators for water-cooled systems (for farm machinery; motor-vehicles, etc.) and oil-cooled systems (production machinery, heavy motor-vehicles, etc.).

Cylinder units mass-produce hydraulic cylinders for use in machine tools and hydraulic presses (distribution chests), lifting and dumping equipment (lift trucks, power shovels), remote controls; in motor-vehicles (power-assisted steering, brakes, and clutches, etc.), and pneumatic cylinders for applications in pneumatic and mechanical equipment, remote controls, compressed air starters.

Other units mass-producing products in wide use include those concerned with the manufacture of bearings (ball, roller, needle bearings, etc.) steel cable (for boilers, cranes, gantry cranes, excavators, mobile cranes, bicycles, mopeds, hoists, winches, buckets, hoisting equipment, etc.); flexible steel tubing (for various protective purposes, coupling sleeves, sheathing, etc.); roller chain to connect transmission units in machinery, agricultural machines, mechanical equipment, for timing control in motor-vehicles generally, for lifting sliding parts of lift trucks, etc.).

Finally to complete the vast range of intermediary units in the engineering field which supply widely-used products to the main units of the various constituent sectors (heavy and medium engineering, precision engineering, electrical engineering) there are units making internal combustion engines for machines (agricultural machines, earthmoving machines and various civil engineering machines, lift and transporter trucks, etc.), small compressors (for domestic electrical appliances, etc.) mass-produced electric motors (for plant and equipment, machinery, domestic appliances, etc.), electrical materials for industrial consumption including electric cable and wire, batteries (for use in electrical parts of plant and machinery, motor vehicles, etc.), and electronic materials for industrial consumption (valves, diodes, transistors, etc.).

Finally, important supplies to engineering units come from other intermediary units belonging to various sectors of processing industries: textiles, vegetable horsehair and felt, imitation leather, etc; plywood and semi-prepared timber: tyres, tubes and air-cushions; various rubber products such as tubing, pressings, extrusions and foam rubber, leather belts and rubber and canvas V-belts, etc., steering wheels; clutch and brake-shoe linings; welding filler both ferrous and non-ferrous; adhesive and insulating tapes; insulating

materials; various chemical materials such as pastes, adhesives, paints, enamel, primer, rust inhibitors, thinners, solvents, additives, protective agents, putty, etc. toughened, plate and other glass.

It is also important to know which of the intermediary units described above operate in all sectors of engineering and which work exclusively for given sectors and in particular for heavy and medium engineering.

But before passing to this question it should be noted that certain intermediary units may also operate for other branches of industry. Whereas the "subsidiary" units mentioned belong, by nature, to sectors of engineering, the "auxiliary" units may, in principle, provide services associated with production equipment (plant and machinery, etc.) for all industries (manufacturing, mining, etc.) even though, in the large concentrations, the majority of these auxiliary units in practice work predominantly for the engineering industries. Many other "intermediary" units, mentioned above, supply production and/or maintenance materials, etc. to all industrial sectors in general.

This having been made clear, the table lists intermediary engineering industries according to their use by industries in the three major sectors into which engineering is divided; heavy and medium engineering; electrical and electronic engineering; precision engineering (1).

Information on the use made of intermediary units by industries in the sectors mentioned is limited to materials and services related to production and maintenance. The letter "U" is shown when the use made of intermediary units by the industries of a particular sector relates to production, and also, possibly, maintenance materials and services and the letter "m" when it relates exclusively to materials and services for maintenance requirements. These initials only appear for inputs of a certain importance and relate to the highest level of specialization by main and intermediary industries to be found in the largest industrial concentrations.

Because of its artificial nature, such a presentation can only be regarded as an outline of the broadest kind. The initial indicating the use by an engineering sector of a given type of intermediary unit is shown whether this applies to the majority of the industries constituting the sector, to a few of them or to one only. Information on the use of "intermediary" units by the individual industries in a given sector will be given further on where intermediary units providing important inputs to the selected main units are analysed. Here the purpose is purely to point out similarities and differences between the major sectors of engineering in their relations with the intermediary units.

A quick examination of the list discloses a number of important similarities and differences. Electrical engineering requires, among the auxiliary units, its own type of special forming tool shops for the production of special dies (special forming tool shops); precision engineering needs subsidiary units to handle its own type of machinery and mechanical and plastic forming (precision machining units, precision presswork, precision thermosetting and thermoplastics). In general there appears to be a close affinity in the use of intermediary industries by the large and medium engineering and the electrical engineering sectors, in contrast with a more limited use by the precision engineering sector.

We have no need to take this point further since this report is concerned exclusively with heavy and medium engineering; it is merely necessary to note that the setting up of intermediary industries for the sector in the industrial pole will also encourage other engineering activities, particularly electrical engineering.

The list of intermediate units for heavy and medium engineering given in Table 4.2.1. - I will be used as a basis of reference, in all that follows, for the analysis of the auxiliary, subsidiary and other intermediary units; it is only when finally determining the intermediary units which must be established in the pole that we shall consider a simplified intermediate production structure which may feature units combining more individual specialities but nevertheless still corresponding to compound types of intermediary unit now operating in large industrial centres, to which reference has already been made in section 4.1. The reason for this is that whilst analysis of inputs to the main units shows that advantages of comprehensiveness are to be gained when the intermediate range available is as detailed as possible, conclusions regarding the auxiliary and subsidiary units which are essential at Bari and Taranto and are feasible with a sustained demand from the minimum aggregate of principal units will be easier to reach if a simplified intermediate structure is envisaged. In fact, particularly for the auxiliary units (and above all the special equipment workshops) the demand required to ensure economic unit size implies a large number of main unit customers; by combining several specialized activities to form compound types of intermediary units, their economic size can be made relatively smaller and therefore the number and size of the main units to be planned can be reduced.

4.2.2. — *DETAILS OF INTERMEDIATE UNITS PROVIDING INPUTS FOR THE SELECTED MAIN UNITS.*

Table 4.2.1, attached, shows details of the inputs—although no quantities are yet given (2)—for selected main units in large and medium mechanical engineer-

(1) For the definition of these sectors see table 4.2.1-I.

(2) The quantities are given in 4.2.4.

ing by groups, classes and types of intermediate units from which these inputs are derived and according to the most detailed classification adopted. The inputs in question are provided by the intermediate units defined in 4.2.1 above, which provide current factory inputs, including those for maintenance requirements. The list of inputs is confined to the most significant, thus excluding those whose quantities and values only have a negligible effect on operating costs.

The table shows the direct relationships between main and intermediate units, but the indirect requirements of the former arising from inter-relationships of the latter are not shown. As a partial exception, account is also taken, among the intermediate units, of those which are complementary to tool-making workshops and provide maintenance which can otherwise be handled by main units (internal maintenance).

The table shows the main units in the principal column with their own code (I, II, etc.) and their lines of production with the relevant code of the amended NICE; the subsequent columns show the various groups, classes and types of intermediate units according to the Italconsult nomenclature.

For each main type of production, a symbol appears opposite the intermediate units when their output is used as an input by the main unit. In this section, devoted only to indicating the important inputs without yet distinguishing the essential ones which would require the presence of the corresponding intermediate units in the pole, no attention should be paid to the different colours of the symbols.

It should merely be borne in mind that the square symbols indicate production (and possibly also maintenance) inputs, while the round symbols represent inputs relating exclusively to maintenance requirements.

The indication of the individual inputs for each main type of production is based on the following assumptions and criteria:

a) the outputs of the main units correspond to the levels of production of the largest existing firms of the kind in Italy;

b) requirements of inputs of all the most diverse types of products in the Italian and Community market are considered jointly, and not just those of a specific type;

c) the organization and manufacturing criteria adopted by the main units are those observed by the industries in the most industrialized countries.

It should be noted that the indication of inputs in the table would not be the same if different assumptions were made regarding levels of production. For example, for the manufacture of liquid-fuel burners (355/56), if the levels of production were assumed to be considerably lower than those of the largest firms, the inputs shown would no longer include those from subsidiary medium-machining units. In the opposite case of substantially higher production levels, inputs from subsidiary units engaged in large metal-forming would have to appear, under certain conditions. This is because the economic use of various type of sub-contracting processing units depends on the size of run (large, medium, small) of the parts to be entrusted to these units.

The choice of the highest Italian production levels (and not those encountered in other EEC countries) as the standard of reference is due solely to market reasons and/or to other motives explained earlier.

With regard to the second standard (reference to all the types of products most widespread in the market), it should be explained that, depending on the various types of products considered, the origin and type of certain inputs may change. In such cases, all possible inputs are shown together in the table. For example, in the case of line 361/1c—construction of motor cultivators, motor mowers, etc.—in some types of these machines the main body (gearbox and transmission) is made of cast iron, while in other types it is of cast aluminium; the table shows both the corresponding input from subsidiary iron foundries and that from subsidiary non-ferrous-metal foundries.

The inputs shown in the table reflect the most highly-developed techniques. This leads to differences in inputs as compared with those corresponding to traditional techniques. We can take as an example line 353/10—metal structures, bridges and structural steel. The cutting of girders, drawn members and section members and the drilling of holes for bolts is still often carried out by traditional standards and means. According to the techniques considered here, the butting and drilling of the modular elements, presupposing medium or small series, are carried out with tooled machines, entailing inputs from tool-making workshops for medium and small machining and, as a result, requirements for welded items other than those needed in maintenance of miscellaneous machinery, electrical component, and metal-removing machine tools.

The organization of production is the same as in the most highly industrialized regions, which have a predominantly "horizontal structure" (in the sense of production adequately supported by auxiliary and subsidiary units), representing one of the essential bases of specialization. This type of organization is in contrast to the "vertical structure" which predominates among firms in the industrially less advanced regions such as are to be found in Southern Italy. Even in Northern Italy, unlike other areas in the EEC, the structure of intermediate mechanical engineering activities is incomplete, since the subsidiary activities of gear-cutting, metal-forming, processing of thermoplastic and thermosetting materials are lacking and/or inadequate (in the motor-vehicle industry, in particular, there is also a lack of special sub-contracting units producing pistons, rear axles and differentials, etc.; for precision engineering there is a lack of subsidiary units for precision forming, etc.).

In particular, the Italian industrial triangle does not possess any real gear-cutting plants producing, to order, any kind of toothed components (not only all types of gear-wheels proper, but also the whole vast range of other toothed components such as splined shafts, hubs, sliding couplings, synchronizing gears, multi-threaded screws, sector gears, etc.). Units using large quantities of toothed components as inputs are supplied, (especially large and medium-sized firms), by a "vertical" system. The units which produce their own toothed components are equipped with the necessary additional machinery. Apart from certain all-purpose machines, such as lathes, milling machines, drilling machines, grinding machines, etc., these units must possess machines needed specifically for the production of toothed components (such as broaching machines, gear planers and hobbers, chamfering machines, shaving machines, super-finishing machines, lapping machines, special grinders, special sharpeners, etc.) the corresponding equipment (1), the necessary apparatus for various checks, and special plant and equipment (furnaces, miscellaneous hardening equipments, etc.) for the various heat treatments to which the "blank" toothed components have to be subjected.

Apart from this first group of units which meets its own needs by means of a vertical organization, there are others which meet them partly internally (preparation of components for cutting of teeth, etc.) and send the semi-finished products to intermediate units (tool works, etc.) or main units (firms which manufacture machine tools, etc.) which, by their type of production or because they are organized vertically, possess the machinery, apparatus and plant to complete the processing of the components in question (finished or semi-finished tooth-cutting, with successive operations of shaving, heat treatment, possibly tooth-grinding, etc.). A third group of units orders the toothed components which it needs direct from the above-mentioned tool works and/or from machine-tool manufacturing units, etc. The firms whose inputs of gearwheels, etc., are limited in amount generally belong to the two last-mentioned groups.

With certain exceptions, Italian producers of toothed component either for internal use and/or as suppliers to order, manufacture in small lots, in view of the relatively limited quantities which they process and the wide variety of types. This entails frequent changing of tools and consequent adjustment of the machines, which adversely affect the latter's performance. In view of the considerable amount of idle time, it is necessary to fill the gaps by resorting to a relatively larger complement of production equipment which would by rights call for planned mass production of toothed components such as characterizes the activity of a specialized gear-cutting unit. It should be noted that there is in fact incomplete saturation of production equipment (saturation being taken to mean its maximum productive use).

It is obvious that such possession of a relatively larger amount of production equipment, working at lower capacity, means higher costs for toothed components. Comparative analyses carried out specially for the present study for levels of production equal to half of capacity (minimum economic dimensions) of subsidiary units specializing in gear-cutting appear to indicate at least 10 % higher production costs for toothed components. This is the case with large main units which use substantial quantities of toothed components produced by a vertical system (units for manufacturing machine tools, agricultural machinery, etc.).

As regards metal-forming, if one or two units serving limited areas are excluded, there are practically no subsidiary units of this type in Northern Italy. The large main units using pressed components as inputs meet their own needs by a vertical system. Such firms have to make substantial capital investments to provide themselves with the necessary equipment (hydraulic, mechanical, friction and guillotine presses, forming presses, strain-relieving presses, shears, croppers, etc.).

Apart from exceptional cases, including most large units, the quantities pressed by the firm itself are relatively limited and often consist of a variety of items. Consequently, the equipment of the units in question is less productive than that of a specialized subsidiary unit producing long runs on a programmed basis. Costs are affected not only by the inadequate and underloaded forming machinery but also by the more frequent changing of the dies and the resultant need for specialized labour (operators, etc.).

Other main units whose relevant inputs are limited obtain their pressings from workshops making metal-forming tools which, since they possess presses, operate in this case, in an accessory capacity, as subsidiary units (that is, apart from supplying the first series which normally accompanies the supply of the die). Nevertheless, costs are higher because of the working equipment usually possessed by these tool-making workshops, the quantities which they process and, above all, the inadequate production standards inevitably resulting therefrom (different from those of a specialized subsidiary unit).

It should furthermore be noted that in various lines of production there are main units which, as they own presses which are not sufficiently used, also operate in an accessory capacity as subsidiaries, producing limited quantities of pressings as sub-contractors.

Comparative analyses show that costs are at least 5 % higher for pressings made in vertically integrated main units which are large users of these (manufacture of sheet-metal kitchen units, metal kitchenware, etc.) than for those made by subsidiary units specializing in metal-forming. The lower costs of the subsidiary units are due, within certain limits, to the possibility of making greater use of more powerful equipment

(1) Special implements, tools and gauges.

and carrying out the processing operations more efficiently (less rejects, etc.) and flexibly, achieving the maximum continuous saturation of the machinery. It is obvious that, for the main units producing their own stamped parts in modest quantities and for those which resort to the afore-mentioned tool-making workshops, etc., unit costs may exceed the percentage quoted above.

The causes and origins of the above-mentioned structural deficiencies of the mechanical engineering sector in Northern Italy were analysed in section 3.2; there is no doubt, however, that they help to reduce the competitivity of the main industries concerned and that, in planning a new pole in the South, it is necessary to aim at achieving the more advanced structures required by the Common Market.

A special case is provided by thermosetting and thermoplastic materials for mechanical engineering. In Northern Italy, instead of genuine subsidiary units which produce parts made of thermosetting and thermoplastic materials, there are some supplying firms which distribute the orders from the main units to a large number of home-workers, to whom they supply the necessary small machines and the plastic materials for processing. Owing to the low cost of this labour (substantially less than that of factory workers) and the small overheads, these firms are able to sell at prices which are more than competitive in relation to those charged by specialized subsidiary units in other countries and by any which might be formed in Italy.

In conclusion, the results of the analysis would appear to show that the requirements of the selected main units affect, taking them as a whole, all the auxiliary units except the large and special tool-making workshops for metal-forming, the large pattern-making units, the large supplementary welding units and the auxiliary electro-plating units. The tool-making workshops for heavy metal forming do not appear in the table because we are considering only, in this context, the maintenance needs of the main units. The repairing of very large dies (for example, those for the pressing of sheet-metal bathtubs - 355/7c) can also be carried out by tool-making workshops for medium metal-forming; only their construction involves the use of a tool-making workshop for large metal-forming. The tool-making workshops for special metal-forming are auxiliary units which in practice actually belong to the electrical-engineering sector. The large pattern-making units have been omitted from the table because of the principle of considering only repair and not construction requirements; the repairs of large foundry patterns required for the construction of metal-removing machine tools (363/11) can also be carried out by medium-size pattern-making shops.

The processing services of auxiliary large welding units are not needed by the selected units as either direct or indirect requirements; they would be required for some lines in the sector, such as the construction of metal-forming machine tools - 363/12 (structure of presses: crosshead, bedplate, uprights). No inputs of auxiliary electro-plating units appear, because they represent indirect requirements, being in fact for equipment for subsidiary gear-cutting units (chromium-plated shafts for various turning operations, etc.).

All the subsidiary units except special foundries and large-scale thermosetting and thermoplastic units are concerned. The former are not required for the needs of the selected lines. Such foundries would be of interest for lines of production not selected, such as: 354/20, equipment for pipes and tanks; 363/20, tools for machines; 364/11, construction of textile machines; 365/1a, machines for mills and plastics factories; 365/1c, for sugar; 365/1g, machines for the chemical and associated industries; 366/10, plant for mining and drilling; 366/20, machinery and equipment for the iron and steel industry, etc.; 368/2c, machines for the graphic arts; 369/1b, marine engines (turbines); 369/3b, special pumps, etc. With regard to the large thermosetting and thermoplastic units, these are units actually belonging to the electro-engineering sector rather than to the sector which we are considering.

Lastly, practically all the other intermediate units producing "commercial" and "standardized" inputs are found to be merely suppliers of one or more selected main units.

4.2.3. DETAILS OF INTERMEDIATE UNITS TO BE REGARDED AS ESSENTIAL, IN TERMS OF PROXIMITY, FOR THE SELECTED MAIN UNITS AND THOSE OF THE SECTOR IN GENERAL (1).

If the policy for the pole under consideration was to plan and promote all intermediate units in the sector (at least one unit of each type), there would be no need to perform the work of selection discussed earlier on. But this would not be a practical solution.

In view of the technical factors determining intermediate demand (the inputs of the principal units for many materials and types of processing are limited) and the economic scale on which the various intermediate units must operate (some types must be fairly large) such a policy would, in practice, entail the

(1) The examination of the intermediate units to be regarded as essential, i.e. whose presence in the area of the "pole" is considered indispensable for proper economic and technical operation of the selected main units, and, in general, of the large and medium mechanical-engineering sector, is limited to the processing industries which provide production and maintenance inputs (see 4.2.2.). The fact that the examination is confined to this field does not mean that there are no other industries and services which satisfy the intermediate demand of the large and medium mechanical engineering industry and play an essential role; e.g. the industries concerned with the production and/or distribution of electricity, water, natural gas, etc., which must necessarily be operating on an adequate scale in the area, or certain industrial services.

creation of a very large number of main units for the new pole, thus contradicting one of the aims of the present study, which is that of determining and proposing a minimum—and yet feasible—integrated set of projects. In this connection it was realized that an excessive number of integrated units would raise almost insuperable difficulties as regards simultaneous promotion, finding labour, etc.; on the other hand, as will be seen further on, the advantages of establishing every type of intermediate unit in the "pole" would be negligible from the point of view of the efficiency and competitiveness of the principal units in the sector.

In other words, although it is true that all types of intermediate unit are present in the great concentrations of Central and Western Europe, the survey carried out in the course of the present study shows that a number of these cannot be regarded as essential for the main units operating there. The presence of such types of intermediate units is due, rather, to the convenience of working with a large local clientele—although this is location factor concerning these units themselves, and not the main units.

The intermediate units to be created in the "pole" therefore must and can be limited to those which are essential for the main units.

The determination of the intermediate units which must be located in the new industrial centre at the service of the main units in the sector (the existing ones and those which may be established there in the future) cannot be based, in accordance with traditional economic principles, primarily on the "differential" transport costs of the intermediary products (creation of intermediate units supplying the main units in the pole with products which would be too large an item in the latter's production costs if obtained from existing centres).

Such principles, as already mentioned, are inspired by transport facilities, distribution systems, commercial policies and productive techniques which have been superseded in the EEC. While, with the passage of time, production has become increasingly specialized in the manufacturing industries leading to ever-increasing needs for technical contacts between main units and certain types of intermediate units, the development of transport has steadily reduced distribution costs for the materials used by the industries. Along with other factors (competition, etc.), this has enabled the producers of many intermediate products, especially those very widely used, to apply uniform list prices for the whole of the country ([1]).

Thus the transport costs of intermediate products for industry are no longer, save in exceptional cases, of decisive importance, while on the other hand the role of the "contacts" which main units need to have with intermediate units for certain types of work and supplies has become essential.

This observation is clearly valid in the present study, which has as its purpose the creation of a new industrial pole in a region set in the economic context of Italy and the EEC. Its validity would be reduced if we were considering the creation of a pole in a wholly undeveloped country with a low degree of industrialization, an inadequate transport system, etc. (For the creation of a large and medium mechanical-engineering pole in an undeveloped country it would be necessary to consider, in addition to the "contacts" factor, the factor of "transport costs" for supplies of intermediate products, and this would immediately make it necessary to regard as essential a larger number of types of intermediate units).

The above is confirmed by a comparative study of transport costs for production materials (actual cost of transport plus packing) to be met by main units in the field of heavy and medium mechanical engineering located respectively in the area of the pole and in the Italian industrial triangle.

Table 4.2.3. - I shows directly the effect of transport in terms of the higher costs of supplies at Bari as compared with Milan. This increase is expressed as a percentage (percentage relationship between the cost of the materials free at a main user unit in Bari and the corresponding costs in Milan) and by classes of production materials (depending on whether they come from primary, subsidiary, or other intermediate units) ([2]). Lastly, as already mentioned, the effect is shown only when the transport cost has a practical effect on the main units which are customers, and not in the cases where (for instance, many commercial and standardized products), owing to the general price policy followed by the supplying industries, the distribution cost is equally divided among all the sales on the Italian market and is wholly or partially absorbed.

The estimate for Bari concerning inputs from primary units takes into account the present availability of supplies of certain rolled sections from the iron and steel centre at Taranto; as regards inputs from subsidiary units, the absence of such workshops in the area is noted; for the inputs from "other intermediate units" account is taken of the existence of some firms already in operation or in course of being set up, which act as stores for certain commercial and standardized products, and also of those which may be established in the fairly near future owing to the increase in demand resulting from the "normal" industrial development of the area. All non-local supplies are assumed to come from primary and intermediate units in the nearest areas: depending on the case, from Naples, from Central Italy or from

([1]) Uniform list prices at warehouses in centres of some importance covering the whole country.

([2]) For the sake of greater completeness, the table analyses not only production materials from intermediate units ("subsidiary" and "other intermediate" units) but also those from primary units, i.e. the iron and steel industry.

Northern Italy. For Milan the supply costs used as the basis for the comparison refer for the most part, except for certain iron and steel products, to supplies from within the northern industrial triangle itself.

The table shows in the first column the minimum and maximum differences recorded for all types of main industries in the sector taken singly (and not only the selected units); the second column shows the difference obtained by taking the average for all types of the said industries (1).

The data tabulated would seem to indicate that owing to higher transport costs in comparison with Milan, the main units (already existing or to be established) would have to pay from a minimum of 1 % to a maximum of 4 % (average 3 %) more for supplies of production materials from primary units (unfinished blanks); from 1 % to about 3 % (average 2 %) from subsidiary units (finished blanks and parts) and from 0.1 % to 0.4 % (average 0.2 %) from other intermediate units. The difference for all production materials, depending on the various main units, would seem to range from 0.4 % to 3 % (average 1.3 %), but the effect on the total production cost, taking into account the relative weight of the materials in question, would appear to be on the average less than 1 % (from minima of 0.3 % to maxima of somewhat under 2 % for a few industries such as structural metal work, etc., where this relative weight is high and where also inputs from primary units predominate). If we consider only the supplies of production materials from intermediate units ("subsidiary" and "other intermediate"), the incidence becomes insignificant (2).

In the light of all the data presented it is therefore not possible to postulate, on the basis of the differential cost of supplies due to transport, that any intermediate unit belonging to the sector must be located near to the main units. This does not, of course, mean that distance from the supply centres does not have an influence on the possibilities of "contacts" between customer and supplier units, which, as has been stated, play a decisive role in determining which intermediate units are essential and also with regard to other important aspects which affect production costs.

It is a known fact that, in general, modern industry increasingly tends to develop closer geographical links between processing industries, while those between the latter and the basic industries become looser. In a document issued by the EEC Commission (3), when only the first results of the present study were known, it was rightly observed that the causes of this phenomenon are to be sought in the fact that, as the products of the basic industries are now "for the most part perfectly specified, technical contacts between the processing industries and the industries supplying them are less necessary, and the basic industries confine themselves increasingly to establishing technical-commercial offices in the centres where there are processing industries, with the task of sales promotion (steel, aluminium and glass technical centres, etc.). The close interdependence to which the afore-mentioned geographical links of the processing industries are attributable is found primarily in coherent fields of activity such as medium mechanical engineering, electronics, etc.".

The final results of the above-mentioned Italconsult survey have made it possible to define more closely the nature of the location factors within these "coherent" sectors (homogeneous sectors according to the terminology of the present study) and of the relationships between main units of a sector and their supplier units. It has been found that in the various sectors of mechanical engineering there are appreciable differences in the geographical links between main units and intermediate units. Actually, the conditions mentioned above for the "basic" industries are found to exist, though sometimes to a lesser degree, for all intermediate units manufacturing "standardized" or "commercial" products. In most cases it is sufficient that there should be agents and representatives for these products in a given industrial centre; frequent technical contacts are generally not necessary, save, exceptionally, in the case of new products, etc.

The need for contacts between the main units in the mechanical engineering sector and units of the "other intermediate" group are thus limited in comparison with the very close contacts which are, on the other hand, required for processing operations sub-contracted to auxiliary and subsidiary units. From this fundamental point of view, the needs and advantages which impel the main mechanical engineering units to establish themselves in the large industrial concentrations would appear to be mainly attributable to the presence of auxiliary and subsidiary units and not to that of other intermediate units. It follows that, in principle, the units of these first two groups are the ones which should be regarded as the essential intermediate units for the sector under consideration.

A selection of this sort is of such importance for the present study that this question deserves to be further explored, taking into account not only the question of technical contacts but also other points (stores of

(1) The data are derived from a detailed survey covering all the mechanical engineering industries which goes beyond the limits of the present study and was undertaken by Italconsult with a view to other future studies of industrial development in Italy and the EEC.

(2) No account has been taken, in the foregoing analysis, of the effect of the incidence of transport costs on consumption and maintenance materials, since their relative weight in total production costs is generally no more than 4 % and 2 % respectively. Evaluated on the basis of these relative weights, the ranges quoted above for higher transport costs for supplies from primary and intermediate units, become practically nil.

(3) EEC Commission, Directorate-General of Economic and Financial Affairs, Group No. 1, instructed to study the problems of the relationships to be developed, 1st report, Brussels 23 March 1964 — Internal document.

commercial and standardized materials, etc.) in so far as these may affect the competitiveness of the industries which are to be located in the area of the pole in relation to the large industrial concentrations of Northern Italy and the countries of Central and Western Europe.

Essential character of auxiliary units

As far as tool-making workshops are concerned, the main units in the large industrial concentrations have an organization (with suitable staff connected with the technical works department and the methods and purchasing department) which, by personal and sometimes daily contacts, can expedite the delivery of equipment and keep a check on the progress of subcontracted work. In view of the frequent need for tools (modifications to products involving adaptation of existing tools, replacement of equipment which has become inefficient, repairs, etc.), this organization is required to avoid the serious economic harm which would be caused by delays in delivery from auxiliary units. These would lead, in the main unit concerned, to delays in starting production of a modified product or in current production, thus seriously impeding both the course of production and the sales programme. It would become necessary to use makeshift equipment, involving much longer production cycles, in order to avoid stopping manufacture of the finished product; otherwise manufacture of the part requiring the missing equipment would have to be stopped, while continuing manufacture of the other parts to be held in stock; or, possibly, the end product would have to be assembled incomplete and held in store. In the first case, labour costs are greatly increased and in the other two cases costs increase either owing to production for storage or because overtime is generally necessary in order to catch up with the production schedule when the equipment is obtained. The possibility of such delays and their consequences are thus reduced to a minimum by the above-mentioned easy contacts due to the proximity of the tool-making workshops (and their complementary units) to the main units.

It should be pointed out that the close proximity of tool-making workshops is less essential from the point of view of the supply of initial equipment. In other words, whereas the range of economic utilization of these units is limited with regard to repairs and modifications, it is enormously increased in the case of manufacturing new equipment. This is because, normally, in the main units the manufacture of a new product is programmed to an appropriate schedule which allows for the times required to deliver new equipment, which may be obtained, if necessary, from tool-making workshops in distant centres or even abroad. Similar considerations apply to the supply of new patterns for production castings.

In Southern Italy, for the main units requiring work to be carried out by tool-making workshops in the North ([1]), delays in delivery and defective deliveries can more easily occur owing to the impossibility of continuous direct contact. The expediting organization cannot bring the necessary pressure to bear at the right time and, even assuming that this work could be done in the same way, or less satisfactorily, through a branch office, the cost would be substantial.

In view of the slight incidence of the cost of transporting equipment, the real problems therefore lie in the delays which may result from the conditions described above and in the risks of long-distance shipment of production equipment of which stocks obviously cannot be kept because of its nature. All these problems arise from the absence (within range of economic use) of tool-works for repairs, replacements, etc. of these items of production equipment, which are the more essential the more manufacture is organized on a mass-production basis.

In the case of main units in Southern Italy which keep their own equipment in efficient running order, the problems and increased costs are certainly no less than those mentioned above. This practice requires, in particular, processing work by skilled labour and specialized machinery which can only be employed to a small extent in view of the substantial variations in equipment repair and construction requirements. Furthermore, additional problems arise from the local lack of the necessary electric power units, foundries and forges, treatment units, etc., entailing the need for additional labour, machinery and plant—again not economically employed—at the expense of the main units.

As regards maintenance and servicing of plant and machinery in the large industrial concentrations, the main units (in addition to the intermediate ones) generally call on specialized auxiliary units for special maintenance and periodic overhauls. These rapid and prompt services help to keep the production equipment constantly efficient and to remedy, in the shortest possible time, the damage caused by production stoppages.

When main units situated in Southern Italy, where there are no such auxiliary maintenance and service units, have to call on the North for these services, the handling of their orders is more difficult and there are possibilities of delays and mistakes in supplying items, which may prove to be not entirely suitable. This leads to increased costs, which are due not so much to the price of the service (the cost of transporting the equipment is not generally of any significance, and the sending of fitters, etc. is also not a major factor) as to the longer stoppages which occur.

([1]) In Southern Italy, genuine tool-making services are found to exist only in Naples. These are confined to small equipment for mechanical processing and sheet-metal pressing and in any case, owing to their number and size, can only partly meet local needs.

On the other hand, direct provision by main units for all their own maintenance and service requirements involves, except for very large firms, the permanent employment of maintenance staff (in addition to the normal routine maintenance staff) entailing greater specialization and incomplete utilization of labour. Even then there are, in addition, the difficulties and extra costs due to the absence of auxiliary local forge, foundry, pattern-making and treatment facilities.

Essential nature of subsidiary units

It has been seen that, with a few exceptions, the main units generally enjoy the convenience of having their blanks produced externally by subsidiary foundries and forges and certain parts made by other sub-contracting units (machining, metal forming, etc.).

The main units located in the major industrial concentrations enjoy great advantages owing to the proximity of such subsidiary units (reduction of investment in special plant, full use of machinery, etc.).

A suitable staff (belonging to the materials supply department, with the duty of expediting orders and checking the terms of supply contracts) keeps in very close touch with the workshops, as required by the complexity and frequency of scheduled deliveries, possible modifications of parts purchased for various improvements, etc.

Delay in delivery of blanks by subsidiary foundries and forges would stop production of the parts made from them; delayed delivery of parts made by sub-contracting subsidiary units would hold up assembly operations. This would cause difficulties similar to those described above for delays in delivery of equipment and would entail substantial increases in manufacturing costs. It should be noted that the large units which have a materials-supply programme safeguard themselves by building up adequate stocks either in their own stores or at the subsidiary units which supply them; nevertheless, the control function exercised by the "expediters" is still essential, since such stocks are, for economic reasons, kept within the limits of the requirements resulting from "normal" discrepancies between schedules and actual production.

For main units in Southern Italy which rely on sub-contracting subsidiary units in Central and Northern Italy (1) the distance is such that delays in delivery, and thus hold-ups in production, are more probable owing to the practical impossibility of frequent direct contacts with the supplying units. Transport risks such as the danger of goods arriving damaged, etc., are considerably increased. Such damage involves additional expenditure on repair of the items supplied (straightening of dents, removal of rust, adjustment and overhaul of damaged equipment, etc.). Furthermore, the difficulty of correcting mistakes in the items supplied, as regards their number, replacement by similar parts, and defective items, is increased.

There is no doubt that, within certain limits, these disadvantages are remedied by the system of stock-holding by the main unit and the supplying subsidiary unit, but the return to normal delivery conditions takes longer, and this affects the rate of production of the main unit. It is thus understandable that the delivery and operating conditions outlined above lead to higher production costs.

With a view to reducing delivery times, the main units in Southern Italy may have recourse to larger stocks (larger than the "normal" stocks of firms in the North) but these always involve higher costs (for increased investment in stocks and building of storehouses, increased expenditure on protecting and maintaining the material stored, etc.). The solution of larger stocks is valid only for supplies from subsidiary units which involve holding small amounts in terms of value, weight and bulk. This applies, for example, to extruded and sintered components and micro-castings, which are also inputs of which only a limited number go into the end product, on which it is easier to keep check and for which there is relatively less need of frequent direct contacts with the supplying units.

Main units in the South which do not wish to use subsidiary units in Central and Northern Italy are obliged to tie up more capital, to be overstaffed in some departments and to operate plant and machinery at less than full capacity, etc., with the result that they are faced with problems which, though different, are still difficult and add to production costs.

The presence of subsidiary units producing extruded and sintered items and micro-castings (unlike the subsidiary foundries and forges of sub-contracting metal-removing and forming units and, of course, of treatment units) may therefore be regarded as not being essential in the area of the "pole" for the industries of the sector in question. This is true in general at sector level, while not excluding the possibility that the local lack of a certain type of these subsidiary units may create certain operational problems for the manufacture of some products. Moreover, the stated necessity for most other types of subsidiary units again refers to the sector level and does not apply to particular cases; for example, for some main units with large-scale series production geared to a small range of products, the supply of castings or pressings may be economic even when coming from subsidiary units some hundreds of kilometers away.

To sum up, there is no doubt, generally speaking, that the lack of local auxiliary and subsidiary units has a negative effect on performance whether the solution is supplies from distant industrial centres or vertical

(1) Except for some foundries (iron, steel and aluminium) operating in the South, mainly in the area of the Naples pole, where there is also a major unit producing sintered parts, the few activities are generally organized on a craft basis.

integration. It is difficult to assess how much the lack of adequate auxiliary and subsidiary units increases the production costs of the mechanical engineering industries of the South and in the area of the "pole". The effect varies with the industry, the size of units, the production organization, etc. From various data which have emerged from the present study it is estimated that, apart from the greater difficulties encountered by operators and management owing to the complex organization and the frequent unexpected snags, production costs are, on average, increased by 10 % and more in these circumstances.

Other essential intermediate units

It has been stated that the supplies obtained from "other intermediate units" do not, as a rule, require frequent contacts. There is, however, no doubt that main units in the large industrial concentrations possess an advantage in having access to local agencies, concessionaires, etc., with varied and ample stocks. (Moreover, the proximity of intermediate industries manufacturing products whose selling price to the customer is directly affected by their share of actual transport costs—for not all items are sold at prices fixed on a national basis—brings further savings, slight though they may be).

The main advantage undoubtedly springs from the large number of possible suppliers and the external local stocks which these offer, since this eliminates or greatly reduces the possibility of a stoppage in assembly, or incomplete assembly, by the main units if, for any reason, they have exhausted their own stocks of such items. It is obvious that such a state of affairs would create problems similar to those described in connection with delayed deliveries from subsidiary units. This eventuality should be infrequent for a well-organized firm; there is a greater probability, however, of unforeseeable requirements of certain commercial and standardized items which may be needed from time to time for maintenance purposes.

As regards the possibility of local stock-holding, supplies from "other intermediate units" differ greatly from those provided by auxiliary and subsidiary units. While the latter consist of specific items processed for the main units and possessing their own special characteristics, so that it is not possible to replace them immediately with substitute items from elsewhere, the former, by their nature, are—within certain limits—replaceable by others available on the market.

Only part of the "other intermediate units" needed by the mechanical engineering industries are present in the South; a greater disadvantage, however, is the fact that, owing to the smallness of the existing concentrations—including the relatively advanced pole round Naples (concentrations which are even more limited if considered in terms of the presence of main units with similar inputs)—the distribution of various commercial and standardized products is often inadequate, since the level of demand does not economically justify the creation of agencies holding stocks of complete ranges in quantities sufficient to meet the most varied demands. This means that, for such intermediate products—even if sold at the same price as in the northern areas when they are available locally—the main units are faced with problems which involve greater efforts of organization and planning for these materials, leading to cost increases.

It is precisely the inadequacy of local external supplies of such products, in terms of delivery periods and range of choice, that worries industrialists (and not the possible transport costs), although admittedly the resultant difficulties do not in practice have such a decisive effect as the non-availability of local auxiliary and subsidiary units.

The presence, in the pole under consideration, of a more complete system of local stocks, although desirable, does not constitute an indispensable condition for the establishment of a complex of main industries in the field of large and medium mechanical engineering operating competitively in Italy, in the EEC and on the international market. Actually the presence of an initial nucleus of large units in the pole will justify (by the scale and frequency of orders, etc.) the creation of local stocks of a large proportion of all the commercial and standardized products constituting inputs for their types of production. Certain difficulties will remain with regard to the availability of commercial and standardized products for which the demand is heterogeneous and infrequent, for maintenance needs which the main units will have to satisfy by appropriate measures (air transport, etc.). In the new structure of production which would be created in the area (presence of all the essential auxiliary and subsidiary units), the normal incentives are considered more than sufficient to offset the disadvantages resulting from the inadequacy of some supplies. (It has already been seen and will be explained in detail when the individual products are discussed in the section comparing operating costs with equivalent units in the Milan area that, allowing for incentives, the various cost differentials in the two locations offset each other, the balance being appreciably in favour of Bari.

To sum up, it is not considered essential for the pole in question, at least to start with, that any of the "other intermediate units" should be present in the area, except for bolt and nut units to produce these inputs which are widely used in large quantities by most of the industries in the sector and which, in the case of special bolts and nuts, can be regarded as genuine subsidiary activities (1).

The conclusion reached does not, of course, mean that every effort must not be made to facilitate the crea-

(1) For poles based on heavy mechanical engineering in other regions and/or countries and/or based on other engineering sectors, such as electrical engineering, the above conclusion might be very different.

tion, in the area, of local stocks of products used by industry and the establishment of units producing such goods. On the contrary, while the development of the pole will gradually improve the distribution system of these intermediate sectors (many supply problems will in future be solved by the development itself), the establishment of an increasing number of these intermediate units will increase the technico-economic integration of the area, which is fundamental to the external economic relationships of all industrial concentrations.

From this point of view development will take the form not only of a greater number of auxiliary and subsidiary units (types of subsidiary units will appear which were not originally proposed because they were not considered essential and because local demand was not yet sufficient, such as units producing extruded components, etc.) but will also lead to the creation of engineering units (spring factories, units making hydraulic equipment, pneumatic equipment, taps and cocks, valves, etc.) and non-engineering units (units producing rubber sections, pressed parts and tubes, materials for welding, paints, etc.) which manufacture specialized commercial and standardized products. Because of their size these units would produce for wide markets; a large proportion of the demand would, however, of necessity come from units in the area and other poles in the South. (The integration of the Bari-Taranto and Naples poles will take place mainly through the supply and demand of these intermediate industries).

It should be noted that if the existing main units, and particularly the new ones, in the various poles in the South were to standardize their "commercial" inputs, the conditions would be created for the possible establishment, in some of these areas, of large firms producing these intermediate items. But this is difficult, if not impossible, to achieve in practice, since it would entail promoting a process whereby units would have to modify and standardize certain parts and component groups of their products and take account of this in the planning of new models. For instance, if the different units manufacturing elevator trucks, etc., used the same kinds of connections, valves, hydraulic cylinders, etc., with standard specifications, the resultant reduction of the present range of such inputs would proportionately increase the demand for the standardized types, which might then reach levels corresponding to the economic scale of appropriately-tooled series production by a new firm to be established in the South. Such a process could, however, be attempted in the pole by suitable arrangements between the large units; if something of this sort were done, the increased local demand ought still to be supplemented by possible sales on the national and foreign markets.

It would not be possible to satisfy the size requirements on the basis of the market created by the initial nucleus of the proposed pole (but this will become increasingly possible as it gradually expands). For example, the selected industries will require altogether about 15 000 internal-combustion engines for use in the construction of combine harvesters (361/1a), motor mowers, etc. (366/4a); mobile cranes (366/5b); lift trucks, etc. (366/5e). Only two thirds, however, are low-power engines, the remaining third consisting of medium and high-power engines required for various manufacturing purposes. Even assuming that all the main units obtained their supplies from intermediate units in the area, the demand for these engines would be very far from fulfilling the requirements as to minimum economic size ([1]). On the other hand, the commercial distribution system of some of the large Italian engine-manufacturing firms ensures, even in the South, regular delivery to all destinations and low transport costs.

Similar negative conclusions can be reached if we consider the possibility of a factory for series production of electric motors as an intermediate unit in the pole area. There is a considerable input of electric motors into selected units for the production of centrifugal pumps (369/3a), liquid-fuel burners (355/56), metal-removing machine tools (363/11), cranes (366/5c) and continuous mechanical conveyors (366/5d), which would absorb altogether 120 000 per year. A substantial proportion of these (see inputs of certain types of burners, cranes, mechanical conveyors) would represent developments and adaptations of the series models (motors with special drive flanges), while the rest of the demand would be for the standard types. In this case, too, the total demand would not be sufficient to attain the necessary economic scale for a factory mass-producing electric motors; on the other hand, the supply might be provided via the efficient systems for the distribution of these items which already serve the main centres in the South ([2]).

To sum up, the following are considered essential, in principle, for the main heavy and medium mechanical engineering units; all the auxiliary units, all the sub-

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([1]) The engines for combine harvesters and earthmoving machinery, for instance, are medium and heavy motor-vehicle engines produced by the motor manufacturing companies (FIAT etc.) either for fitting in vehicles they make or for industrial uses, including those in question. The engines for lift trucks are medium-capacity motor-vehicle engines. The engines for motor cultivators are also manufactured by large motor-vehicle and scooter factories for mounting in these vehicles and for industrial uses. Whereas, in the case of medium and heavy motor-vehicle engines, the units in the pole would absorb about 5 000 per year, the minimum economic scale would be in the region of 50 000 per year, and for single cylinder engines the corresponding figures are 10 000 as against 100 000.

([2]) The demand for and output of series-produced electric motors would be in the region of 100 000 per year, whereas the economic size of a factory of this kind would be of the order of 200 000 and above. Furthermore, a possible intermediate unit for large-scale series production of electric motors, provided the total market demand called for it, ought rather to be considered in the vicinity of the Caserta-Naples-Salerno pole, the basic structure of which includes the electrical engineering sector.

sidiary units except those making extruded and sintered components and micro-castings and, among the "other intermediate units", only those producing nuts and bolts.

A first indication of the inputs supplied to the individual selected main units by essential intermediate units can be obtained from Table 4.2.1, considering both the square symbols (inputs for production) and the round ones (inputs solely for maintenance), coloured red; inputs which are important but not essential are shown in black. For a correct assessment of the essential inputs it must, however, be borne in mind that the symbols in the table represent inputs relating to production levels of main units corresponding to the largest firms existing in Italy and to all types of products most widespread in the market, and not specifically to the levels and products fixed for the similar selected units of the pole.

If these levels vary, the inputs may also vary. It has been seen, for instance, that for metal structures, bridges and structural steel (353/10), although the level of production chosen for the units to be created in the pole does not reach that of the largest firm of this kind in Italy, this level is such as not to cause any change in the structure of the inputs in question. On the other hand, for the manufacture of sheet-metal cookers (353/5a) and centrifugal pumps (369/3a), the scales of production envisaged, although large in Italian terms and equally competitive (see 4.2.5), are smaller than those of some of the biggest firms. Consequently, heavy-machining by sub-contracting units does not represent a really essential input for production lines 353/5a and 369/3a for the selected units, since the lower level of production means smaller series and hence different requirements from some types of subsidiary units. Similarly, the setting, for certain proposed main units, of production levels somewhat below those of the largest Italian producers, involving non-series processing, means that these units do not really need inputs from medium machining units for lines 355/5b (liquid-fuel burners) and 369/3a (centrifugal pumps), or from small machining units for lines 366/5c and 5d (cranes and continuous mechanical conveyors).

Specific consideration of the selected products suggests that some inputs of materials required only by other types of the product of the same line, shown jointly in the table, are not essential. Thus, for instance, for the selected main units the manufacture of continuous mechanical conveyors (366/5d) and metal-removing machine tools (363/11) does not require inputs from subsidiary steel foundries; the manufacture of mechanical diggers, etc. (366/4a) does not require inputs from subsidiary foundries producing grey pig iron; the manufacture of pick-up balers (361/1b) does not need inputs from subsidiary steel and non-ferrous-metal foundries; and the manufacture of liquid-fuel burners (355/5b) does not require inputs from subsidiary steel foundries and forges.

For the precise details and quantities of the inputs to the selected main units from essential intermediate units, see section 4.2.5. below. The intention here was only to show how the list of the intermediate units essential for individual main units changes with different levels of production and types of products. This confirms that what is said in the present study concerning the essential character of certain intermediate units, while valid for the pole under consideration, does not necessarily apply to other poles in other regions or countries, this being a matter which must be determined case by case [1].

Lastly, it is important to point out that, in principle, the intermediate units which are essential for supplying inputs to the selected main units together cover, with a few exceptions, the requirements of the whole large and medium mechanical engineering sector.

Excluding the sub-contracting machining units which belong particularly to the sector of precision engineering ("precision" machining, "precision" forming, "precision" thermosetting and thermoplastic components) and the auxiliary and subsidiary units belonging particularly to electrical engineering (tool-making workshops for special forming equipment [2] and large thermoplastic and thermosetting components), it can be seen that only three types of auxiliary units (tool-making workshops for large forming, large patterns and large welded items) [3] and one type of subsidiary unit (special-alloy foundries) would remain uncovered.

The absence of a tool-making works for large forming would affect the suggested cast-iron bathtub industry (355/7d) solely as regards the supply of new metal

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[1] As stated earlier, even assuming that the selected lines, levels of production and types of products are identical, a different transport system, greater distances from sources of supply, different systems of distributing materials, etc., might, for example, lead one to regard as essential certain inputs (inputs which are more used and/or of greater volume and/or calling for greater care in transport, etc.) from "other intermediate units" which were not considered essential for Bari-Taranto-Brindisi. It should also be noted in this connection that, as the new pole under consideration is to be located in the South, where there are already large iron and steel centres (Taranto and Bagnoli), the problem of supplies of this kind which can now or later be obtained in the pole on terms similar to those applying to the units in the industrial concentrations in the North has not arisen; if it had been necessary to procure such supplies from places at too great a distance, the presence of an iron and steel unit would probably have been considered essential, at least for some industries. There are thus cases where certain primary products of the mechanical engineering industry may be essential in terms of industrial location.

[2] Extending the definition given in 4.2.2 for tool-making works for special metal forming to products not included, the only lines in the sector which would use them would be the manufacture of knives and cutlery (355/2) and of hardware, locksmiths items and miscellaneous fittings (355/3).

[3] The auxiliary galvanizing plant, although it does not appear in Table 4.2.I, is nevertheless proposed for the whole complex, since it is regarded as essential for the equipment of the subsidiary gear-cutting unit and the auxiliary tool-making works for light machining.

patterns; repairs would be carried out by the proposed tool-making works for medium forming. The position of this main unit would be similar as regards the supply of new dies, which can, however, be repaired by the "medium" toolworks (it should be remembered that dies of this sort for large drawn metal products are not made in Italy). The absence of the large pattern-making unit (large wooden patterns for foundries) similarly affects only the possibility of obtaining new patterns of this sort locally, but not their repair, which can be carried out, as already mentioned, by the proposed medium pattern-making unit. The pole would not include either the auxiliary unit for large welded items for industries such as the manufacture of metal-removing machine-tools (363/12) or the subsidiary special-alloy foundries for the production of equipment for chemical and allied industries (365/1g), industries producing heat turbines (369/2), special pumps (369/3b), etc.

Total coverage of the sector in terms of essential intermediate units, i.e. the inclusion of the three missing types, is not possible because it would inevitably entail the establishment of main units which have already been eliminated in the earlier process of selection for various economic and technical reasons related to the criteria adopted. Moreover, taking an overall view, such coverage does not appear absolutely essential in the initial stage of development of mechanical engineering in the pole. It is necessary in this connection to repeat what has been said earlier on the subject—namely, that it will be the actual forces of "natural" development of the pole, based from the outset on industrial inter-relationships, that will create, in successive stages, the conditions (demand, etc.) for the completion and multiplication of all the types of auxiliary and subsidiary units, for the expansion and appropriate structure of local stocks of the commercial and standardized products used in mechanical engineering production, and for the increasing presence of industries producing these materials (especially industries belonging to mechanical engineering sectors themselves and, to a lesser extent, to the chemical and petro-chemical sectors) and of industrial services (technical offices, etc.).

The list of intermediate units regarded as essential for the selected main units and, within the limits stated above, for the heavy and medium mechanical engineering sector in the pole is given in Table 4.2.3 - II.

4.2.4 CALCULATION OF INPUTS REQUIRED BY SELECTED MAIN UNITS FROM ESSENTIAL INTERMEDIATE UNITS

BACKGROUND AND GENERAL PRINCIPLES

This section describes the process of calculating the inputs required by the selected main units as direct demand from the essential intermediary units to be promoted in the pole. These inputs (additional to potential demand from the main units existing or in process of establishment) together with the indirect demand arising out of the interrelationships operative within the sector must be sufficient to ensure that the essential intermediary units can operate on an economic scale.

In subsequent sections, such a balance between demand and intermediate supply emerges, it would appear, automatically, inasmuch as it is based on the final findings of the study, i.e. on the data obtained in the feasibility studies for the selected main units and essential intermediary units. In reality, this is the outcome of earlier complex calculations using simplified methods applied to a large number of production lines and not only to the eighteen concerning the activities of the eight main units finally chosen, whose inputs are discussed here.

As pointed out in 4.1, the choice of the main industries was made in two stages. A first immediate choice was made according to whether or not they fulfilled exclusion criteria 1, 2, 3, 6 and 7 (respectively: need to concentrate production, territorial specialization in the centre-north of Italy or other poles in the south; units existing or being set up in the pole, and market criteria); in the second stage the 60 or so lines remaining were gone through several times, reducing the total number while maintaining the necessary balance between demand and intermediate supply. This second stage was directed, within the limits of the above described requirements, to a study of criteria 4 and 5 (proportion of skilled labour required and size of the demand for certain essential inputs). Before this could be done, however, we had to compute the inputs required from the essential intermediary units for all remaining lines of production; this involved determining the corresponding typical products (representative of the entire range in terms of inputs), the production levels of analogous units of competitive size, etc.

It should be noted that the assumption of standard products for the main production lines in question greatly simplified the task of determining inputs and the subsequent framing of projects. Again, in view of the market potential for the various types of products, the actual production choice in favour of one or more types to be turned out by a future plant in the area will be governed by policy varying from firm to firm (for all of which valid reasons can be adduced in support), by the availability of patents, and so on. Since the purpose of this report is to produce a series of feasibility studies with a view to promoting undertakings on a basis of their proven ability to compete if established in the pole it would have been out of place, as well as pointless, to attempt at this stage to make a choice which almost certainly would not coincide with that actually made by the entrepreneur carrying out the project. Estimates for the main lines therefore refer not so much to the quantities of the various types which would actually be produced by the units (once they are set up) but rather to the selected typical products. With this approach, how-

ever, it was possible to arrive at a satisfactory estimate of all essential inputs of the main lines of activity, except as regards the specific tooling requirements for which it was necessary to take into account the probable production range.

The results in the preliminary report were only quantitative estimates of inputs for the selected main units. However, these estimates were still based on a simplified methodology because the feasibility studies had not been completed at the time.

These (or similar) methods will, however, have to be considered again in any future studies of the same kind, simply because they are imposed by the course of the study. (There is in fact no possibility of using highly refined methods, which are justified only when the feasibility studies concern industries determined *a posteriori* on the basis of appropriate studies and selection criteria). Moreover, despite their relatively approximate nature (with one or two exceptions), the methods referred to yielded estimates varying not more than ± 15 % from the projects. A summary description of the methods may therefore be of interest in this Final Report. First, however, it is necessary to set forth the general criteria used for estimating quantities within the expected pattern of interrelationships.

In this connection, it is first of all necessary to make it clear that the essential inputs for the main units concern only those derived from the intermediary units as defined within the general context of the pole in 4.2.3. The computation of such inputs refers to a system of intermediary units comprising as many types as possible even if, *a priori,* and as already established, the total demand levels planned for the area will compel certain units to form groups of the types which are normally found in the most highly industrialized areas in the EEC (1). This will be dealt with in 4.2.8, when the discrepancies between maximum objectives and possible practical implementations can be assessed.

The fundamental relationships between main and intermediary units governing the quantitative estimates correspond, in general, to those described in 4.2.4, with the following refinements:

a) the tool-making workshops are needed to cover "current" requirements of the units in the sector, in other words to keep existing equipment in running order (repairs, alterations, partial reconstruction, replacement of tools no longer useable as a result of damage or such modifications of detail as are introduced). The toolmaking workshops are not designed to provide the initial equipment of pole units deriving from the substitution of types of products but to supply a proportion (approximately 50 percent) of subsequent new equipment (2). In order to supply the initial equipment the tool-making workshops would have to be bigger than is needed to cover demand in subsequent years. The possibility of providing all new tools was rejected because for a relatively long period the number of client units in the area will be limited; as a result demand would be fitful and, to be met promptly, would require the tool-making plants to be built on an uneconomic scale. Inputs are also required by main units from the tool-making workshops in the shape of tools loaned out to subsidiary units working for them. The subsidiary pressing units are a case in point;

b) the pattern-making units repair and replace all types of pattern supplied to the foundries for the production of castings (3). Even though it is the foundries that repair the patterns the procedure here was to ascribe the appropriate input to the client unit concerned;

c) the plant maintenance and service units handle special maintenance and overhaul of units' plant, up to two-thirds of the total number of hours required annually; the machine maintenance and overhaul units up to one-third; and units responsible for the maintenance and overhaul of transport vehicles and warehouse plant up to three-quarters. As an exception to the foregoing, furnaces, foundries and galvanizing plants, because of their nature, cover their entire needs in the way of plant maintenance and overhaul with their own facilities. Similarly, in addition to these furnaces, foundries and treatment units, the tool-making workshops also handle all their own machine maintenance and overhaul. Maintenance units repair their own machinery and plant;

d) the main units whose products involve the use of heat-treated materials, obtain the latter from the heat-treatment units. Only the gear-cutting units, possessing their own plant, carry out heat-treatment on their own account (4).

e) the main units do not themselves produce deep-drawn articles (possibly only articles made of sheared, punched, flanged, sheet, etc.) but order them from the subsidiary metal shaping units. Likewise, all units, including tool-making workshops and maintenance units order gearing etc. from the gear-cutting units;

(1) As an exception, inputs deriving from auxiliary units, electrical equipment forming part of machinery and equipment of units for maintenance and overhaul of miscellaneous machinery (electrical parts) are lumped together.

(2) An exception here is that the supply, even in part, of new tools does not cover the requirements of the subsidiary heavy pressing works making bath-tubs. It has already been noted, however, that where sheet-steel bath-tubs are concerned, toolmaking workshops with sufficient experience are not to be found in Italy so that the required tools have to be imported. Nevertheless, the operational need for repairs to such tools may be dealt with by installing appropriate equipment at the medium-size tool works for metal forming.

(3) As an exception to this, there is no provision within the pole for the replacement of large patterns. This is due to the limited demand (from client units over a period). Repairs to patterns of the kind can, in any case, be carried out by medium-sized pattern-making units.

(4) Auxiliary and subsidiary foundries and furnaces also handle their own heat treatment, but in this case "primary" treatment is involved.

f) as a general rule, the main units work two 8-hour shifts daily for 250 working days per year. One or two exceptions are contemplated (one 8-hour shift daily) for units such as those producing heavy metal structures, cranes and mechanical conveyors, lift-trucks and the like;

g) inputs are expressed in kg/year. Only in the case of maintenance are they given in hours/year.

Turning, now, to the simplified methods of computing inputs from the essential intermediary units (as used in the selection stage) it must be made clear that the technical coefficients for production materials are generally direct estimates. In one or two cases only was it possible to use the internal statistics of establishments interviewed. Statistical information of the kind, even where available, proved inapplicable in most cases. The fact is that the information varies considerably, even in respect of one and the same product, depending on types of product, production level and differences in production organization (hence the serious limitations on using the coefficients obtainable from the present study, as they stand, in other similar studies which properly require special research and estimates). On the other hand, greater scope for using the internal statistics of the establishments interviewed came to light in comparing technical coefficients associated with maintenance requirements.

For every main unit it was necessary to analyse each and every typical product in its component groups. For each group the materials required and the associated processing operations were determined in broad outline. Having established the processing operations which, according to pre-established general criteria and other criteria (see below), were to be performed by the subsidiary units, it was possible to determine the operations which were to be performed within the main unit. The latter were then used to calculate, again in broad outline, what specific tools would be required (general and other tools not supplied by the tool-making plants were excluded).

More precisely, in order to determine the operations required by the various groups and assemblies of the standard products considered, we had to establish the basic processing sequence (i.e. their cycle of manufacture). Starting from the processing operations to be carried out within the main units, we determined—still in principle—what tools would be needed for the purpose. Depending on the technology involved, the run contemplated, etc., we established the quantities of the various types of tools to be used for heavy, medium and light machining, assembly (welding and mounting), medium and light metal forming. The quantities for standard products were increased to allow for the wider range that the units may, in the event, produce.

The quantities so obtained were checked by comparing their value (number of kg multiplied by average prices per kg) with data supplied by establishments making products similar to those envisaged for the lines examined in this study.

From there the next step was to determine, for the various classes of tool-making workshops, what proportion would require alterations, remaking, etc., each year, within the limits of the general criteria set forth above. Here, too, a check was made by reference to internal data obtained from various establishments concerning the annual incidence of the cost of maintaining and modifying tools as compared with the total cost of such equipment. And it is precisely this proportion which forms the current inputs of tools owned by the main units. The inputs in question were expressed in kg of parts replaced as a result of repairs, alterations, etc. (1)

As regards maintenance and service inputs, since data were not yet available on the various types of plant, machines, etc. to be installed in the main units (these were determined only in the projects), technical coefficients were worked out from production levels and used to determine inputs for each production line. The coefficients were based on internal statistical surveys of establishments having as far as possible analogous structures and equivalent production levels, or, again, were obtained by appropriately "interpolating" the data obtained from several establishments with reasonably similar production levels (2).

These "interpolations" are not linear but allow for non-proportional and non-modular variations in plant and machinery production rises (but, for transport vehicles and storage equipment proportional variations were assumed).

The coefficients so obtained refer to hours per year for maintenance and overhaul per unit standard product (labour only, excluding the supply of necessary materials) (3). Applied to the projected production level (only as regards the part for which the main unit makes use of outside services) these coefficients gave the corresponding annual inputs. It goes without saying that the coefficients were worked out and applied by classes of assets and in accordance with the

(1) For example, metal-forming tools, especially for punching, require exceptional repairs amounting to practically complete replacement (save for such parts as bases, etc.) Partial replacements may concern, for instance, chuck guide bushes on reaming tools; bushes on drilling tools. Repairs may even concern the trueing of dies, sharpening of punches for punching presses, and so on.

(2) Certain establishments supplied information on the number of hours needed for maintenance and overhaul in addition to information on production levels. Others stated the annual cost of maintenance and overhaul; others again the percentage incidence of that cost on the value of the output. In the second case, allowance was made for an average cost distinguishing the proportion representing incidence of materials processing.

(3) It was assumed that since the maintenance and overhaul units receive blanks and assemble finished products they only call on other units for any hot processing that may be required.

corresponding types of auxiliary maintenance and service units.

Miscellaneous internal statistics were used to work out the quantities of the various materials (only those supplied by intermediate units included in the scheme), required on average for one hour of the different types of maintenance and service. These materials are obtained from auxiliary foundries supplying cast iron, steel and non-ferrous metals, and from pattern-making units (as mentioned earlier, the patterns, although used by the foundries, are commissioned by the main units in accordance with the criteria adopted and are included with their inputs); from auxiliary forges, from units producing gearing and nuts and bolts. Since it must be assumed that the main units provide the materials required for maintenance and overhaul in addition to covering their own needs in respect of maintenance and overhaul, the corresponding input is obtained by applying the above mentioned coefficients to the aggregate (i.e. internal plus external) number of maintenance hours.

The amount of materials required per type of plant, machinery, etc., for maintenance and overhaul was estimated in the aggregate for all selected main units on the basis of the corresponding total hours. The inputs in respect of these materials were expressed in kg of blanks.

The main units' inputs of production materials, (excluding those obtained from primary units), are those derived from the subsidiary iron, steel and non-ferrous foundries and the forging and hot-stamping works; as already explained, these were directly estimated from the weight of blanks in the assemblies constituting the standard products.

All materials processed outside the main units for making gears and the like and deep-drawn products are considered as inputs to be obtained entirely from the subsidiary gear-cutting and metal-forming units. These inputs (expressed in kg) were sub-divided among the various types of metal-forming units (large, medium and small) on the basis of the characteristics of the largest groups and of the respective daily outputs.

Next, when estimating inputs required for large, medium and small metal-removing by the specialized subsidiary units, we had to determine what proportion these should represent of all metal-removing needed in the manufacture of the appropriate parts of the standard product. Since no processing time or other analyses ([1]) were available for the purposes of determining what internal processing pattern would most suitably keep the machinery fully occupied and, therefore, what part of the processing could best be entrusted to external subsidiary units, it was necessary to apply average percentages based on the internal statistics of similar establishments.

In this case, also, we tried to refer to establishments turning out the same products with similar techniques and comparable outputs. The percentages were however checked against direct estimates of quantities of all simple components i.e. those obtained directly as a result of such processes as turning, drilling, reaming and the like. Depending on their length of run and size, all these components were entered under inputs supplied by large, medium and small subsidiary metal-removing units.

In this connection, account was taken of the fact that the inputs in respect of subsidiary metal-removal account for from approximately 1 % to 15 % of the aggregate of such processing (internal and external) depending on the respective main lines. The inputs in question were expressed in kg of finished items.

Inputs of nuts and bolts (expressed in kg) were obtained by directly estimating the quantity of each type required for the assembly of each standard product of the lines studied (requirements, already noted, for maintenance materials have to be added).

As already stated, the methods adopted for calculating inputs and described in this section are the same as those used in the feasibility studies forming part of this Report in respect of the eight main units finally selected. In the first place (allowing for a certain range) each standard product was considered no longer in terms of assemblies but in terms of its component parts. By using the specific knowledge of technologists possessing experience in the respective types of products, it was possible, even without recourse to detailed and laborious computation (justifiable solely at the executive project level) to evaluate schematically the manufacturing cycles; these were used to determine the production apparatus (specific equipment, machinery and plant) required, the duration of the manufacturing cycle (cycle time, machine time, paid time, associated products, etc.) and, from these, the machine loads and corresponding requirements in terms of machinery, the extent of the subsidiary processing operations to be sub-contracted, and requirements in terms of labour (direct and indirect).

An evaluation of this kind is not usual at the feasibility study stage because it calls for very highly specialized and experienced technologists and involves greater difficulties of calculation than for the executive projects themselves, when all the appropriate methods and detailed breakdowns are applied. The feasibility studies will be used exclusively for promotion purposes; in practice, the typical products will be replaced by a range chosen by the entrepreneur who will implement the project. Complete studies, quite apart from the time and means required, would have been out of place.

When the necessary production apparatus had been determined in the light of the processing operations

([1]) Processing times were determined schematically only for the units finally selected for which preliminary projects were worked out (see below).

envisaged for the various cycles, the coefficients adopted in the preliminary study found a new and more precise basis for application in estimating inputs from tool-making workshops. In the case of inputs from plant maintenance and overhaul units, and associated materials, the coefficients relating to production levels were replaced by quantities and classes of production apparatus. With all the technical coefficients available for production, we made a direct quantitative estimate of all inputs from subsidiary foundries and forges, metal-removing (including gearing plant) and metal-shaping sub-contractors, subsidiary treatment units and units producing nuts and bolts. The breakdown of inputs between the various types of these intermediary units was obtained from the data regarding the respective cycles as reflected in the technical coefficients mentioned.

PRODUCTION IN TERMS OF TYPICAL PRODUCTS AND INPUTS IN RESPECT OF PRODUCTION AND MAINTENANCE MATERIALS

The annual inputs (taken from the feasibility studies concerned) of production and maintenance materials required from the essential intermediate units in normal production are now given for each selected main unit and for each production line involved. All production and maintenance inputs are shown in the respective tables, those from essential intermediate units being in red; in this way their importance compared with the overall figures for these materials can be assessed.

Since the inputs are related to typical products for each unit, it has been thought best to begin by converting the actual output calculated into output in terms of typical products and to follow with a description of each of these.

Unit I

HEAVY METAL STRUCTURES

The works would be designed to produce 50 000 tons of structural steelwork annually made up of sheds—34 000 tons; pre-fabricated building elements—4 000 tons; and miscellaneous structural steelwork—12 000 tons. Production would be confined to preparation of the assemblies and sub-assemblies constituting the final product, thus excluding final assembly. The work done by this unit, moreover, would concern exclusively non-series outputs. (1)

The actual output is converted into typical products equated to actual output in the following manner:

Actual output	Tons	Output in terms of typical products	Tons
Sheds	34 000	Sheds	38 000
Prefabricated building elements	4 000		
Miscellaneous structural steelwork	12 000	Miscellaneous structural steelwork	12 000

For inputs and machining, the sheds are considered sufficiently representative even for the prefabricated building elements. The typical shed is 180 metres long; 90 metres wide; 6 metres high; with a 10 × 10 metres module. Weight: 560 tons.

In view of the heterogeneous nature of miscellaneous structural steelwork a ton of an average product has been used as typical product, reflecting, again in terms of inputs and machining, a vast, if not the complete, range of these products, i.e. furnace structures, towers and supports for transmission lines, heavy beds for production machines, tunnel reinforcements, silos, ladles for molten metal, cement kiln elements, frames and structures for gates in waterworks and river dams, large gratings for hydroelectric reservoirs, support structures for petrochemical plant.

Tables 4.2.4. - I and 4.2.4. - II list the technical coefficients and corresponding annual inputs for production materials for sheds and for miscellaneous structural steelwork respectively; Table 4.2.4. - III shows the total of these inputs for the unit's output. Table 4.2.4. - IV gives maintenance material inputs whilst Table 4.2.4. - V presents external maintenance inputs.

Figures relating to essential intermediate units have been printed to stand out in these tables. As can be seen, among production inputs, the only large quantities required are hot and cold-headed bolts at about 2 000 tons. Among maintenance inputs there are substantial amounts to be supplied by subsidiary foundries and forges and from heat treatment units.

Unit II

MANUFACTURE OF COOKERS, BATHS AND RADIATORS IN STEEL SHEET AND ENAMELLED METAL HOLLOW-WARE

At its normal level of activity the unit's production would consist of the following products and output:

	sq.m.	t
Cookers	75 000	4 736
Sheet-steel baths	100 000	4 400
Sheet-steel radiators	200 000	2 500
Enamelled metal hollow-ware	—	1 000

The cooker output, which allows for 5 % of spare parts, could cover a range of 50-100 models, reducible, by virtue of the use of standardized elements and

(1) Although the general principle underlying the creation of the pole as a whole is centred on series production, two units with non-repetition outputs have been admitted as exceptions for the various reasons set out in the selection criteria. Those units are the present one and that for the manufacture of cranes and mechanical conveyors.

assemblies to 10-15 basic models. For baths the manufacture of a single standard model is envisaged, the same being true of sheet-steel radiators for central heating. The unit's output of enamelled metal hollow-ware would need to cover the extensive range normally in demand on the market for household use.

The typical product adopted for cookers is a combination type cooker having four rings with universal burners for town gas, methane and liquefied petroleum gas: 1 500 watt electric hot plate; gas oven closed by a double glass door with two open positions and thermometer; gas grill, dishwarmer under the oven or two level warming cabinet; balanced hot plate cover. Total weight 63 150 kg.

Size in mm:

	Height	Width	Depth
Cooker	860	850	500
Oven	300	360	390
Cabinet	700	320	400

As typical product for sheet-steel baths we have taken an enamelled bath in 2 mm sheet with fixing feet and waste pipe. Slant to back of bath: 35°; total weight 44 kg; size in mm: length 1 680, width 800, depth 380.

The typical product chosen for radiators is a 6-element hot-water radiator in non-galvanized steel sheet: total radiating surface 2.4 sq.m., total weight 30 kg. It should be noted that a radiating surface of 1 sq.m. has been adopted as typical product for calculating technical coefficients and inputs.

Finally, as regards enamelled metal hollow-ware the typical product has been equated to an average ton of a number of lines covering pans, saucepans and pots in the various diameters, with and without lids. Special manufacturing characteristics would take the form of stainless steel collars round the rim of the pot and lid, if any, and removable handles in matching steel section; high strength, acid-resistant polychrome enamel.

Tables 4.2.4. - VI, 4.2.4. - VII, 4.2.4. - VIII and 4.2.4. - IX give the technical coefficients and related annual inputs for production materials in respect of cookers, steel baths, steel radiators and enamelled metal hollow-ware. Total inputs for the whole unit are summarized in the next Table 4.2.4. - X. Inputs for maintenance requirements are set out in Table 4.2.4. - XI for materials and in Table 4.2.4. - XII for external maintenance.

Particular emphasis has been given to inputs supplied by essential intermediate units. From the table summarizing production materials it can be seen that the unit in question will require large quantities of these materials with considerable interrelation between classes and types; important items are the demand for castings (about 670 tons, mainly cast iron but also steel and aluminium), parts required from subsidiary machining units (140 tons), in particular from the "small" unit, and, especially, parts to come from the "large" (4 740 tons) and "medium" (5 730 tons) subsidiary metal-forming units.

Another fairly important item is the demand for heat-treatment and electro-plating and for cold-headed and special bolts.

The most important supplies of maintenance materials are those involving subsidiary foundries and forges and heat treatment services.

Unit III

MANUFACTURE OF CENTRIFUGAL PUMPS AND OIL BURNERS

The annual production capacity of the unit envisaged on normal output would be 2 400 tons of centrifugal pumps and 800 tons of fuel oil burners for general and special use, on the basis of two daily 8-hour shifts (1).

Output would be concentrated on repetition work but about 10 % could be constituted by special types against a limited number of orders. Within this volume of output the works would also be equipped for the possible combined production of 200-250 tons of hydraulic jacks and electric hoists.

In view of the wide range of types and models produced by the unit and the general lines of the project we have considered it useful to give the forecast of actual output in the form of selected typical products including spares (8 % of effective output); on this basis the conversion of actual production into typical products can be represented in the following manner:

(1) 250 working days per annum.

Actual production	tons	Production in terms of typical products	tons
Electric pumps: centrifugal single impeller, self-priming, vertical shaft, vertical drainage, for heating plant, centrifugal opposed impeller type, for domestic use, for farming and gardening, rotary self-priming, booster and circulating for heating systems	2 400	Centrifugal single impeller electric pumps	2 400
Burners for domestic heating systems, for central heating and air conditioning systems, for industrial furnaces, for drying and heating ladles, for forges; rotary burners for industrial applications	800	Heavy fuel oil burners for domestic heating	800

In working out the forecasts for centrifugal pumps the representative typical product adopted was a single impeller centrifugal electric pump of the monobloc type with a mechanical seal, driven by an asynchronous three-phase motor of enclosed construction with external ventilation; 1" gas entry and delivery connections. Operating characteristics are as follows: delivery 63 litres per min.—head 35 metres—power consumption at pump shaft 1.70 h.p.

Maximum physical dimensions are the following, approx.: length 380 mm, width 210 mm, height 300 mm. Total weight of pump as described and complete with electrical equipment would be 28 kg.

As regards the fuel oil burners, the typical product would correspond to an automatic burner using heavy fuel oil (with a viscosity of up to 10°E at 50°C) with low pressure air mixing and atomization; primary and secondary air supplied through the burner; device for automatic ignition by high voltage spark and automatic shut-off on reaching the set temperature, controlled by photoresistor sensitive to flame luminosity.

Consumption and output characteristics would be as follows: electric motor rating 1/5 h.p., burning rate 2-8.5 kg/h, heat output rating 84 000 cal/h, rating for boilers 15 000 to 65 000 cal/h net.

The complete burner, with cast-iron frame, weighs about 26 kg; physical dimensions would be: length 450 mm, width 310 mm and height 330 mm.

Technical coefficients and the corresponding annual production inputs are shown in Table 4.2.4. - XIII for centrifugal pump manufacture and in Table 4.2.4. - XIV for burner manufacture; the related summary is given in Table 4.2.4. - XV. Maintenance requirements are listed in Tables 4.2.4. - XVI and 4.2.4. - XVII for materials inputs and for inputs from external maintenance carried out by auxiliary units, respectively.

Under the heading of production materials the requirement for castings assumes particular importance, this being met by the subsidiary foundries; gray iron would be mostly involved (about 1 250 tons), followed by—in this order—non-ferrous metals (just under 250 tons) and special cast iron (about 200 tons).

Subsidiary machining and metal-forming units would both be required to supply modest quantities of processed parts (140 and 92 tons respectively, of the "small" type) and bolt units nearly 100 tons of the cold-headed type; a considerable demand would also fall on heat treatment (150 tons) and electro-plating units. The supply of materials for maintenance purposes would involve the foundries and forges, among other essential intermediate units.

Unit IV

MANUFACTURE OF FARM MACHINERY

In normal production conditions the unit's output would cover the following: 1 000 combine harvesters, 1 000 pick-up balers, 4 070 motor cultivators—2 900 with standard implements and 1 170 with special equipment (1), 4 500 motor-mowers and 2 250 tons of other agricultural machines such as machines for rice planting and cultivation, hay-makers, etc. (which have a similar mechanical construction to that of combine harvesters or the other products already mentioned) in demand on the market and in line with the special interests of the operator who will be responsible for creating the unit.

A variety of types was considered for each class of the above products although, as already noted, it is intended that diversification to meet the most varied agricultural uses should, from a constructional point of view, be reconciled with the use of as many common assemblies and standardized elements as possible. The outputs indicated would include 7-8 % of replacement parts.

For the purposes of this study, actual production has been converted to typical products as follows:

(1) Normal implements consist of disc-plough, two-furrow plough, harrow. Special equipment may include, in addition, manure spreader, hoe, grain drill.

	Actual production	Production in terms of typical product	
	in units	tons	
Combine harvesters	1 000	1 500	6 750
Other machines	2 250 t		
Pick-up balers	1 000	1 000	800
Motor cultivators with normal implements	2 900	10 000	3 000
Motor cultivators with special equipment	1 170		
Motor-mowers	4 500		

From this table it can be seen that the 2 250 tons under "other machines" are considered, within the limits of an outline scheme, to be equal in terms of inputs and mechanical processing to 500 combine harvesters of the type selected. The 1 170 motor cultivators with special equipment and the 4 500 motor-mowers similarly correspond to 3 500 and 3 600 motor cultivators with normal implements respectively.

Specifically the combine harvester chosen is of the self-propelled type with the following general characteristics: 3.3 metre cutter bar with a 3 metre cutting width and a height of cut adjustable from 5 to 75 cm; linked, 5-bar reel capable of adjustment forwards, backwards and in height in relation to the cutting mechanism: for corn reaping the reel is fitted with steel tines set comb-fashion; 2 lateral augers with reversed pitch; mobile central rubberized canvas elevator fitted with wooden slats; rotary toothed blade feeder; beater-type drum with 8 bars and with ribs sloping in alternately reversed directions; concave with 12 bars parallel to drum shaft and adjustable; 4-unit straw-shaker in drilled steel sheet with wooden sides; oscillating chute with central aperture matching the sieve; sieve fitted with fan; first dressing shoe with an oscillating motion opposite to that of the chute with 3 galvanized sheet sieves and blade fan; chain-mounted cup elevator, awner and chobber with feed auger; conical chobber with adjustable bars, awner with knives mounted spirally on the auger shaft, steel sheet worm auger; second dressing shoe with 2 sieves and blade fan; steel wire rotary separating screen with manual adjustment of spiral pitch, central auger, 4 shuttered spouts, revolving brush; compartmented grain tank with 4 bagging spouts and sack weighing system; capacity 1 900 litres; metal-cup type return elevator with feed auger fitted in the dressing shoe and return auger to beater drum; 60 h.p. diesel engine clutch drive, speed change, differential, power via main shaft; 4 tyred wheels, wide section non-slip tread on 2 drive wheels, independent brakes; total weight 4 500 kg; working capacity 0.4 ha. per hour.

The pick-up baler chosen is of the trailed type of the following construction: structural frame in sheet steel; tyred wheels; universal joint transmission shaft with torque limiter; quick connection for power take off; 2 position drawbar (for field work and for transfer to road); working height 1.37 m., pick-up width 1.40 m., channel width 0.92 m.; 1 adjustable automatic tying mechanism with fan; eccentric rotary pick-up unit; variable flow feed auger; bale size 0.36 × 0.46 × 0.92 m.; bale weight 20 kg; maximum hourly bale output 5 tons (straw) and 7 tons (hay).

The basic motor cultivator with normal implements selected as typical product would have the following characteristics: single beam bridge frame of cast aluminium; internal combustion engine of 7-8-10 h.p. according to use, forced air cooling, recoil start for 7 h.p. engine and electrical for higher h.p., dry single disc clutch, worm and spiral bevel gear differential with locking mechanism, synchronized 4-speed box (3 forward and 1 reverse) with automatic rear power take off cut-out when in reverse; rear and right-hand side power take off independent of braking device, rapid connection by splined shaft; 4 tyred wheels with independent and simultaneously acting, equalizing disc brakes; weight approx. 210 kg. Normal implements are intended to include the following attachments: single furrow disc plough made in steel section and sheet and consisting of a disc coulter symmetrical about the longitudinal centre line and a ploughshare with two cutting edges; two-furrow plough made in steel section and sheet and formed of two symmetrical bodies with bolt hitching, allowing 180° movement; rotary disc harrow in steel section and sheet formed of two shafts symmetrical about the longitudinal centre line fitted with 2 gangs of 9 dished discs (in specially treated steel sheet) with soil deflectors, central earthmoving blade, saddle on hitch bar, extra weight pans.

Technical coefficients and corresponding annual production inputs are shown in Tables 4.2.4. - XVIII, XIX and XX for self-propelled combine harvesters, trailed pick-up balers and motor cultivators respectively. Table 4.2.4. - XXI gives a general summary of these materials.

Maintenance requirements are shown in Table 4.2.4. - XXII (materials) and Table 4.2.4. - XXIII (inputs involved in external maintenance). All references to figures concerning essential intermediate units have been made to stand out in these tables. Among substantial inputs required for production there are, in particular, those from subsidiary foundries, such as gray iron castings (780 tons approx.), steel castings (315 tons), non-ferrous metal castings (over 200 tons); those from subsidiary forges (about 560 tons), auxiliary machining units (including 160 tons of parts processed by the "medium" unit), metal-forming units (680 tons of "medium" parts and 416 tons "small") and gear-cutting units (over 350 tons of products).

There is also a considerable demand on metal treatment and bolt-making units. The maintenance requirement involves materials from foundries, forges and treatment units.

Unit V

MANUFACTURE OF METAL-REMOVING MACHINE TOOLS

The annual capacity of the proposed unit would be an output of 3 000 tons of metal-removing machine tools for general use. This volume of output would correspond to two daily shifts totalling 16 working hours and with the unit running normally and therefore excluding the initial start-up and adjustment period (see 5.2.5.1.9).

The output from this unit would be concentrated on the manufacture of lathes and milling and grinding

machines for processing parts of medium size. As already stated the horizontal lathe output would cover 7 types totalling 21 models, milling machines would cover 5 types corresponding to 5 models and grinding machines 4 types forming 8 models. At normal activity, output of each type would be as follows:

	tons per annum
Horizontal lathes	1 910
Milling machines	880
Grinding machines	210
Total	3 000

The annual output envisaged would include a percentage of 7-8 % approx. for spares.

In principle the distinctive characteristics of the three basic types that form the output of the unit in question would be as follows:

i) horizontal lathes: bed on two guides, centre height 230 to 460 mm, turning diameter on bed 480 to 890 mm, turning diameter on saddle 260 to 710 mm, bed width 400 to 500 mm, length 590 to 750 mm, 24 work spindle speeds with mechanical speed change, 48 forward and lateral feeds, 48 screw threads—metric, Whitworth and module respectively, distance between centres 750 to 4 000 mm, follow rest 10 to 250 mm, weight 2 000 to 6 000 kg.

ii) milling machines: universal type, table swivelling 45° to left and right, working surface 700 × 200 to 1 500 × 350 mm, automatic feed and rapid traverse in the forward, crosswise and vertical directions, 12 spindle speeds, speed range 50 to 1 500 r.p.m., weight 1 000 to 3 500 kg approx.

iii) grinding machines: universal type, distance between centres 500 to 1 500 mm, centre height 140 to 185 mm, maximum grinding diameter using new wheel 280 to 360 mm, table tilting from ± 4° to ± 13°, table speed 0.2 to 10 metres per min., grinding wheel spindle speed 1 800 r.p.m., grinding-head adjustable ± 90°, work-head spindle speed 80 to 300 r.p.m., work head to rotate through 360°, maximum grinding wheel diameter 300 to 450 mm, weight 2 000 to 4 000 kg.

For simplicity in tabulating inputs involved in the analyses of the processing work concerned it has, however, been considered better to adopt as typical product, not some of the various types and models (those already mentioned to which production will effectively relate), but an average of these expressed as 1 ton of finished product.

Table 4.2.4. - XXIV lists technical coefficients and corresponding annual inputs for production materials. Quantitative estimates for maintenance material inputs and those represented by external maintenance are shown in Tables 4.2.4. - XXV and 4.2.4. - XXVI.

As can be seen the figures in these tables that involve essential intermediate units are underlined. Among production materials particular importance is assumed by castings from subsidiary foundries, primarily gray iron (2 025 tons)—but also malleable, special and non-ferrous metals—and forgings supplied by subsidiary forges (over 260 tons). Demand for gears is also high (some 300 tons). Subsidiary machining and metal forming units are involved to a moderate extent in the "medium" and "small" fields. Finally the main unit will call upon heat treatment (about 130 tons) and electroplating services and bolt manufacture of the various kinds (about 37 tons).

Unit VI

MANUFACTURE OF EXCAVATORS, SHOVEL LOADERS AND SELF-PROPELLED CRANES

The activity of the unit in question will be concentrated on the production of earthmoving machines and self-propelled cranes. Annual output would reach 18 150 tons and would include the making of excavators, shovel loaders, self-propelled cranes and dumpers. These annual outputs include 10 % replacement parts.

This level of production is based on two daily 8-hour working shifts (1), at the unit's normal level of activity excluding, however, the initial start-up period (see 5.2.6.2.10).

As already stated, excavator production, in terms of bucket capacity, would be represented by 3 types corresponding to 6 models covering machines with front-mounted or tipper bucket or with backhoe; shovel loaders would be in four types in the h.p. ratings stated, covering a total of 8 models divided between rigid and articulated frame versions; self-propelled cranes would comprise three models of different capacity; dumper production would cover two models with different carrying capacities (see table below).

The above actual production has been converted into typical products, with a percentage for spares in machine production and the production of dumpers assimilated to that of shovel loaders (2).

It should also be borne in mind that in the analysis of inputs these products are analysed by reducing the various types and models to one average ton representative of each class.

The following table shows the relation between actual production and that in terms of typical product.

(1) 250 working days per annum.

(2) In view of the special affinity, in terms of inputs and mechanical processing, between the production of dumpers and that of shovel loaders, the output proposed for the latter includes a percentage of dumpers equal to about 1 100 tons per annum (including 10 % of replacement parts).

	Actual production	Production in terms of typical product
	Tons	
Excavators	4 150	4 565
– 600 litre bucket	420	462
– 800 litre bucket	870	957
– 1 000 litre bucket	2 860	3 146
Shovel loaders	*10 000*	*12 100*
– 80 h.p.	1 050	1 155
– 120 h.p.	2 750	3 025
– 150 h.p.	4 600	5 060
– 180 h.p.	1 600	2 860
Self-propelled cranes	*1 350*	*1 485*
– 20 ton capacity	300	330
– 30 ton capacity	450	495
– 40 ton capacity	600	660
Dumpers – 20-25 ton capacity	*1 000*	×
Replacement parts	*1 650*	×
Totals	18 150	18 150

The distinguishing characteristics of the machine classes adopted as typical products for the unit are, in principle, as follows:

Excavators:

— completely hydraulic type in the front-mounted and tipper versions, whilst the backhoe model would incorporate a combined hydraulic and mechanical system;

— shovel arms: three-piece driven by hydraulic rams;

— slewing superstructure: of pressed and welded steel sheet, mounted on double-row ball bearing with internal gearing; full-circle slewing;

— heat engine: diesel cycle with pre-combustion chambers, 65 to 120 h.p., electrical starting, air-cooled;

— cabin: panoramic, completely enclosed with hardened safety glass windows; in two parts to facilitate excavator transport; upholstered seat with forward and backward and height adjustment; internal heating possible;

— controls: lever type, housed in the control cabin; levers for all excavator movements and foot controls for selecting speed of motion;

— hydraulic system; special arrangement with foot-pedal control to execute more than one manœuvre at the same time; master in-circuit safety valve and secondary valves for the individual movements; double acting pistons with adjustable liners; axial piston motors for slewing and bucket movement with shock-absorbing and automatic braking equipment;

— cooling system: finned tube radiator; forced air cooling by fan;

— electrical system: normal 24 V plus two headlights for working in darkness;

— tracked base: crawler tractor type track in welded steel sheet and section; hardened steel rollers and wheels; independent front wheels with telescopic system and adjustable track tensioner springs; 2-speed hydraulic engine drive (one per track) with transmission via oil bath reducers; track footprint width 0.500 to 0.950 m.;

— speeds and performance: two travel speeds (2-5 km/h); manoeuvrability in restricted areas provided by counter-rotation of the two engines;

— weight of excavator: 10 500 to 19 000 kg;

— bucket capacity: 600 to 1 000 litres;

— attachments for excavator: face shovel, tipper shovel, automatic discharge shovel, shovel for slant-sided canal-digging and trenching, hydraulically controlled grab bucket, special shovel for loading loose materials, leveller blades, tow-hook, crane, etc.

Shovel loaders:

— rigid frame and articulated frame versions; front mounted loader arms; tyred wheels;

— heat engine: diesel cycle, 80 to 180 h.p. with electrical starting; water cooled;

— speeds: 4 forward and 4 reverse (two for working and 2 for travel);

— transmission: by differential with reducing gear applied to front and rear axles;

— tyres: off-the-road type or wide-base tubeless;

— bucket capacity: 1 150 to 2 300 litres;

— control and bucket lift: hydraulic with double-acting cylinders;

— upholstered seat, with forward and backward and height adjustment;

— weight of vehicle: 7 000 to 16 000 kg.

Special characteristics of the rigid frame wheeled loader would be essentially the following:

— transmission: dry monodisc central clutch with neutral engagement, four-speed change with reversing gear, four driving wheels with power transmission to front wheels by chain drive; clutch and brake steering system.

Essential characteristics of the articulated frame shovel loader are the following:

— transmission: torque converter and hydraulic speed change group; two powered axles;

— brakes: power-assisted hydraulic brakes on all four wheels;

— steering: frame linkage with wholly hydraulic control.

The following accessories can be attached to both versions of shovel loader: outsize shovel, rock shovel; cage bucket, ripper, leveller blade, etc.

Self-propelled cranes:

— with tyred wheels 20 to 40 ton capacity; weight of vehicle 20 to 40 tons; road speed: 40-50 km/h;

— engine: diesel, housed in the undercarriage; 180 to 240 h.p.; electrical starting system; forced air cooled;

— frame: compact electrically welded steel section and sheet structure; three axles, two at the rear having four powered twin wheels and one at the front with steered wheels fitted with hydraulic power-assisted steering; special high load-capacity tyres;

— front suspension: linked, with rubber buffers for safety support under full load;

— transmission, steering and braking controls: differentials with reducing gear (for very small movements and low speeds) applied to front and rear axles; transmission shafts linked by universal joints, hydraulic brakes to all wheels with pneumatic power-assistance; mechanically actuated stabilizers;

— rear suspension: oscillating tandem system for uniform load distribution over all four driving wheels;

— undercarriage: built in electrically welded steel section and sheet; platform slewing through 360°, attached to frame by two-row ball bearing slewing ring;

— automatic safety devices; group of electro-pneumatic valves controlling the following safety devices: end-stop for boom rise and fall, end-stop for rise and fall of load, protection against accidental movement of control levers, clutch-motor unit;

— double-band brakes for slewing motion, operated by the following controls: control lever when crane in use, lock valve preventing slewing, handle for safety brake when crane out of use;

— reversing unit: with paired tapered gears and band clutch;

— control cabin: two levers for lifting, lowering and braking boom and load respectively, all under entirely pneumatic control; accelerator pedal controlling motor r.p.m., welded pressed steel panoramic cabin protected by safety glass windows; upholstered seat with forward and backward and height adjustment;

— equipment; square section tubular boom to give maximum strength under peak loads; hinged two-piece basic boom; extensions of various lengths can be added;

— counter-support: tubular construction; lowering for road travel, equipped with pneumatic self-raising mechanism.

Technical coefficients and corresponding inputs for production materials are shown in the usual way, in Tables 4.2.4. - XXVII, 4.2.4. - XXVIII and 4.2.4. - XXIX for excavators, shovel loaders and self-propelled cranes respectively. The general summary is given in Table 4.2.4. - XXX.

For inputs concerning maintenance see Tables 4.2.4. - XXXI (materials) and 4.2.4. - XXXII (external maintenance).

It can be seen that this unit calls for a wide range of production materials. Among inputs involving the essential intermediate units (the figures for which have been underlined), the most important in terms of demand on the latter are: castings of all kinds totalling 2 430 tons composed of 910 tons of gray iron, about 820 tons of malleable and special iron, approx. 690 tons of steel (allow and carbon); forgings amounting to over 1 500 tons; the various processing work called for from medium and small subsidiary machining units (more than 250 and 500 tons respectively) and from medium and small metal forming units (1 080 and 630 tons respectively) as well as work by gear-cutting units (640 tons of products). Another considerable contribution would be required of the heat treatment and electro-plating units (1 300 and 60 tons respectively) and the bolt units (about 145 tons in all). Maintenance requirements would involve foundries, forges and treatment units among others.

Unit VII

MANUFACTURE OF CRANES AND MECHANICAL CONVEYORS

As already noted, the proposed unit would produce 11 400 tons of non-series cranes and belt conveyors. Production would relate to non-series cranes for mechanical handling services with a lifting capacity of over 50 tons and cranes for continuous heavy service with a capacity of not less than 10 tons. Belt conveyor manufacture, again non-series, would be concentrated on types with a belt width of not less than 500 mm. Production would include a percentage of replacement parts equal to the electrical and mechanical equipment for the cranes, whereas for the belt conveyors it would correspond to 10 % of the electrical and mechanical equipment.

For ease of planning actual production would correspond to the following typical products (equivalence in terms of typical products mainly arises in terms of inputs and mechanical processing):

Actual production	Tons	Production in terms of typical products	Tons
Overhead travelling cranes	8 900	Electric overhead travelling cranes	10 400
Platform gantry cranes	1 500		
Belt conveyors	1 000	Belt conveyors with supporting structure	1 000

In detail, the standard product chosen is a crane of the overhead travelling type with an entirely electrically controlled crab for continuous average service on a normal operating cycle in engineering shops. Structurally the crane consists of: a travelling bridge built

of a suitably braced steel plate framework with side girders carrying service walkways, complete with all safety superstructures required by the regulations in force; the travelling bridge is equipped with a drive giving a medium speed to the bridge itself and a crab formed of a steel frame on which is mounted the crab's own power unit and that of the hoist. This crab is also equipped with all applicable safety devices. On one frame of the bridge a panoramic cabin is provided to accommodate the crane operator working the crane by means of levers controlling the crane's various electrical equipment.

The typical product belt conveyor has been designed to convey free-flowing materials, ie, earth, pyrites, sand, coal, etc. The belt would be of concave section. The conveyor is made up of a steel-section frame on the ends of which are mounted the conveyor end rollers, one driving, the other driven. In the space between the two end rollers are set triplet idler rollers equal distances apart; in the lower part of the frame, flat rollers are placed at suitable distances to carry the return strand. At the driven end the frame is fitted with a screw tensioner for tightening the belt. The conveyor is also fitted at its ends with guide wheels, rubber retainer boards and scrapers.

Tables 4.2.4. - XXXIII and 4.2.4. - XXXIV give technical coefficients and production material inputs for electric overhead travelling cranes and belt conveyors with supporting structure respectively. Table 4.2.4. - XXXV summarizes these inputs. Two further Tables, 4.2.4. - XXXVI and 4.2.4. - XXXII, list maintenance materials inputs and those related to external maintenance.

Prominence is again given in these tables to figures concerning the intermediate units considered to be essential. Among production materials required by the main unit, castings come to over 590 tons (principally steel and malleable iron) and forgings to almost 200 tons. In the same table the gear-cutting units would be required to handle the cutting of 416 tons of large gears as is made clear in the footnote to Table 4.2.4. - XXXIII (only a few smaller gears are required). 70 tons of bolts of the cold-headed type will be required and about 24 tons of material will have to be electro-plated. Once again the maintenance materials inputs for these main units largely concern castings, forgings and heat treatment.

Unit VIII

MANUFACTURE OF LIFT-TRUCKS

As already indicated, the proposed unit would turn out lift-trucks of the mechanical traction type (diesel and petrol driven), with cushion or pneumatic tyred wheels, fitted with various equipment, and with a lift height of 3 to 5 metres. The trucks produced would comprise three basic types with capacities of 12, 20 and 30 quintals. Annual output at normal production level (see 5.2.8.2.10) of one 8-hour shift per day (1), would amount to 5 600 tons of trucks.

The output of this unit would cover a certain range of types and associated models. On this basis a typical product has been selected, as nearly equivalent to the whole range as possible, that would be representative of the inputs and mechanical processing necessary to achieve the annual output stated, which, it should be noted, includes a percentage (7-8 %) for spare parts.

Actual production has been converted into the typical product as follows:

	Actual production		Production in terms of typical product	
	Units	tons	Units	tons
Capacity 12 quintals	1 200	2 880	2 333	5 600
Capacity 20 quintals	500	1 650	—	—
Capacity 30 quintals	220	1 070	—	—
Totals	1 920	5 600	2 333	5 600

The constructional characteristics and performance of the lift-truck of the type selected would be as follows:

— box-type frame in welded steel sheet;

— driving wheels at front, steered at rear, fitted with cushion tyres;

— 4 cylinder in-line 4-stroke diesel engine, maximum h.p. 30 at 2 000 r.p.m.;

— engine and gearbox in compact unit;

— gearbox flanged to axle, two forward and two reverse speeds, all synchronized;

— dry single plate clutch, pedal-operated;

— floating rear axle to accommodate the unevenness of the ground;

— hydraulic, pedal-operated shoe brakes to driving wheels;

— mechanically operated hand-brake to front wheels;

— steering wheel operating on rear wheels, Gemmer type steering box;

— lifting cylinder with Simplex type ram-piston and dual-acting tilt cylinders (two);

— lift and tilt system (with two elements running in a roller guide) driven by high pressure hydraulic pump coupled to the engine; lowering of load controlled by automatic retarder;

— lift height 3 m—forward tilt 2° 30'—rear tilt 10°;

— capacity 12 quintals;

(1) 250 working days per annum

— travel speeds 10 and 20 km/h in first and second gear respectively;
— lift speed, with and without load, 18 metres per minute;
— lowering speed, with and without load, 25 and 18 metres per minute respectively;
— gradient negotiable under load 18 %;
— weight in working condition about 2 470 kg;
— size: length 2.73 metres—width 0.94 metres—height 2 metres;
— minimum aisle width 3 metres;
— minimum turning radius 1.75 m.

Technical coefficients and the related production inputs for the planned unit are listed in Table 4.2.4. - XXXVIII. Materials for maintenance requirements and inputs related to external maintenance are given in Tables 4.2.4. - XXXIX and 4.2.4. - XL respectively.

As regards supplies to the main unit in question the essential intermediate units would have to provide castings in gray iron (over 500 tons), malleable iron (about 420 tons), steel (about 520 tons) and, in smaller quantities, non-ferrous metals (aluminium) and forgings (about 300 tons). The planned unit would also call upon subsidiary machining units (medium and small), gear-cutting units (245 tons) and metal-forming units (medium and small), as well as heat treatment (243 tons) and electro-plating units and bolt units (54 tons). As with other main units the principal maintenance requirements would be castings of the various types, forgings and heat treatment.

The tables already mentioned give prominence, as previously, to the information (types of unit and materials and the associated quantitative estimates) concerning the intermediate units that are considered essential.

SUMMARY OF THE INPUTS TO THE SELECTED MAIN UNITS FROM ESSENTIAL INTERMEDIATE UNITS

The summary given in Table 4.2.4. - XLI shows that the selected main units, in periods of normal production, would absorb each year: over 7 830 tons of iron castings (gray, malleable and special iron), 585 tons of non-ferrous metal castings and 2 010 tons of steel castings, all coming from subsidiary foundries; over 2 820 tons of forgings (including stampings and practically entirely of ordinary or alloy steel) supplied by subsidiary forges; 1 700 tons of parts processed on metal-removing machines; about 13 520 tons of parts made by metal-forming and about 1 630 tons of gears, ordered from the corresponding subsidiary units. Again for production needs, the main units would require respectively 2 180 and 163 tons of heat-treated and galvanized material as well as bolts of various types to a total exceeding 2 500 tons, all from the corresponding intermediate units.

For requirements involved in the direct repair, modification, maintenance and repair of their own machines, plant and equipment, etc., the main units would also require from the appropriate auxiliary units about 52 tons of one-off castings in iron, steel and non-ferrous metals, slightly less than 10 tons of forgings and 67 tons of heat treatment, as well as nearly 100 tons of materials produced by the toolworks of the various kinds and by pattern-making units and, finally, services totalling 117 000 man-hours from the specialized maintenance and repair units.

4.2.5. *CALCULATION OF THE DIRECT DEMAND ON ESSENTIAL INTERMEDIATE UNITS FROM MAIN UNITS UNDER CONSTRUCTION OR ALREADY EXISTING IN THE POLE AREA AND FROM OTHER SOURCES*

Calculation of the direct input requirements of main units determining the output of the essential intermediate units to be set up in the pole area must obviously take into account not only those selected but also those covered by major projects in the course of realization and likewise the requirements of industries already existing in the area itself. For some essential intermediate units, the figures must be further extended to include potential demand from various industries operating in the pole but not belonging to the heavy and medium engineering sector, and from other units established outside the principal region or in other southern regions, etc. which do by and large belong to the engineering sector.

Observing the time needed for promotion of the overall plan, the executive planning of the new units, for their construction and the training of their personnel, it must be realized that not until nearly 1971 will the new factories (both main and intermediate) be operating at "normal" production levels (units of the complex will start production in 1969).

The quantities mentioned (main units under construction, already existing, etc.) therefore relate to 1971-72.

The possible shift of one year in the general programme for completion of the complex would not appreciably affect the results of the calculations.

As regards standpoints and general criteria, the remarks in 4.2.4 regarding the selected main units broadly apply.

PLANNED PRODUCTION OF MAIN UNITS UNDER CONSTRUCTION AND CORRESPONDING ESSENTIAL INPUTS

Consideration is here confined to plans for main units, in respect of large factories which may reasonably be expected to be completed and brought into service by 1971-72, when the main units selected by the present study should be entering into full production. The

inclusion of projects whose completion cannot be counted on with reasonable certainty, at least within the time limits considered, would have introduced a grave risk of overestimating the demand to be met by the essential intermediate units to be created in the pole. Moreover, should such projects or indeed any other development plans pertinent to the various lines of the sector eventually be realized it will always be possible to absorb their demands by increasing as required the capacity or number of certain types of intermediate unit which are considered indispensable.

Minor projects have been excluded, firstly, because there is often doubt as to their construction schedules and completion dates and, secondly, because their inclusion would have unnecessarily and fruitlessly widened and complicated the process of calculating quantities. And furthermore, as will in due course become evident, the possible completion of such projects has been indirectly allowed for in estimating the expansion of existing engineering industries.

Passing from the general to the particular it has therefore been deemed prudent to restrict this study to the new Breda-Insud factories of Brif and Termosud SpA of Bari.

As regards Brif, planned annual production concerns 300 t of high-speed diesel engines, 730 t of farm machinery and 290 t of gears of various types. Engine production will, it is stated, consist of high-speed diesels standardized as a type product to model D.2 6N8V with an annual output of 110 engines of unit weight 2 750 kg. Farm machinery is expected to comprise motor cultivators standardized to medium type M/10 complete with hoes at a unit weight of 225 kg and output 3 200 units p.a.

Observing that the production of motor cultivators is already one of the lines of main unit IV—Manufacture of farm machinery (an output of more than 4 000 p.a. in conjunction with other types of agricultural machine is planned)—this has not here been taken into consideration on the assumption that Breda Insud will duly bear in mind the economic attraction of the present study (i.e. the greater advantages which it offers in regard to competitive power) and of the possibility of joining the wider sphere of activity thereby afforded, possibly in association with other interested concerns. Gear-cutting production is not here considered because it is the specialized activity of essential intermediate units covered by the present study. In fact, two gear-cutting plants would produce altogether approximately 2 000 t of toothed parts which would inclusively cover Brif's requirement of 290 t. They would operate at much higher levels of output and much lower production costs. However, in this case also the solution here submitted does not exclude the building of one of the proposed plants by the aforesaid group of companies.

Termosud SpA would manufacture boilers for the production of industrial steam, diaphragm walls for boilers with controlled forced circulation, heat-exchangers, steel tanks and distillation columns at a rate of 4 365, 300, 296, 600 and 640 t/year respectively. More specifically, these boilers would be of Breda Babcock-Wilcox types FM supplying 4, 12, 38, 60, 79 and 150 t/h; planned annual production of these boiler types is 5, 6, 8, 6, 3, 3 per year respectively.

The inputs shown in Table 4.2.5 - I for Brif and Termosud SpA under the heading "units under construction in the pole" are derived, together with the planned production figures, from data provided directly by the groups concerned.

Examination of the figures in this table shows that the inputs of this group of main units (including those required for maintenance and service) provided by essential intermediate units can be broken down as follows: approximately 170 t of various castings (of which 140 t gray, malleable and special cast-irons, 5 t steel and 19 t non-ferrous metals), 535 t forgings, 83 t machining, 133 t metal-forming, approximately 250 t gearwheels (1), 127 t heat-treated and galvanized material and 72 t nuts and bolts of various kinds. In addition to this, inputs to cover service and maintenance requirements amount to some 20 t for tooling, patterns, etc., approximately 11 000 hours maintenance and overhaul (to be carried out by the appropriate specialized units) as well as various amounts of cast, forged and specially treated materials.

PLANNED PRODUCTION OF EXISTING MAIN UNITS AND CORRESPONDING ESSENTIAL INPUTS. OTHER SOURCES OF DIRECT DEMAND ON ESSENTIAL INTERMEDIATE UNITS

The production forecasts for 1972 for the industries already existing in the pole area and producing finished goods in the heavy and medium engineering sectors take due account of the prospects analysed in 2.1.2 with appropriate extrapolation to the above-mentioned year.

For the purposes of the present study we have included the following branches and show hereunder their production levels in terms of gross value and added value for 1972 at the 1963-1972 expansion rates:

a) Heavy and light metal structural work (353/10, 353/20) and manufacture of metal furniture (355/6a) to a value of 4 980 million lire (added value 1 930 million lire) rate 4.5 %.

b) Construction of cranes (366/5b, 366/5c), mechanical conveyors (366/5d), lifts and hoists (365/5f), other types of lifting gear (366/5g), machines for the mechanical processing of structural materials (366/30) to a total value of 2 070 million lire (added value 840 million lire), rate 6.3 %.

c) Boiler-making (354/20), manufacture of domestic heating appliances (355/5e), cast-iron baths and ba-

(1) In actual fact the direct demand for this input (Brif) would be limited to 73 t whilst the remainder would be required for delivery to other factories outside the pole area but mostly belonging to the same group.

sins (355/7d), household and sanitary equipment (355/7e) and pumps (369/3a) to a value of 899 million lire (added value 359 million lire), rate 5.1 %.

d) Construction of miscellaneous farm machinery (361/1d) for 610 million lire (230 million), rate 3.8 %.

e) Construction of machinery for the oil industry (365/1b), the wine industry (365/1e) and miscellaneous equipment for the food industry (365/1d) for 1 660 million lire (610 million), rate 6 %.

f) Manufacture of hand utensils and agricultural implements (355/11 and 355/12), tools (355/30), light metal packings (355/42), industrial valves and cocks (369/8a) to a value of 8 380 million lire (3 790 million), rate 9.3 %.

g) Construction of railway rolling stock (382/00), assembly of industrial motor vehicles plus construction of special instrumentation and fittings (383/b) and miscellaneous transport material (389/30) for 7 573 million lire (2 630 million), rate 6 %.

The above schedule omits all mention of work in connection with the building, maintenance and servicing of ships (381/00) and aircraft (386/00), because such work is considered incapable in practice of exerting any determining influence on demand from the intermediate units to be planned for the pole.

The above schedule, which follows the NICE nomenclature, must not lead to any misconceptions as to the importance of the industries already in the area; a glance at the relative figures for gross and added values should make the position quite clear. As repeatedly stated and minutely discussed in section 2.1.2 which analyses the present structure of industry in the area, the firms concerned are predominantly small or medium-small, including many of a semi-craft nature. The only exceptions are a number of units established during the last few years in the spheres of light metal structural work, industrial valves and cocks (Pignone-Sud of the Breda-ENI group at Bari) (1) and assembly of industrial motor vehicles (Calabrese e Romanazzi workshops—ICAR, Bari).

In calculating the volume of inputs, allowance has been made for a gradual transition of existing main units from a predominantly vertical structure to an integrated system; incorporation of existing main units into the system of intermediate units will be progressively completed if not during 1972 then during the next few years.

On the basis of the foregoing production estimates, it is assumed that by 1972 the industries already existing in the pole will be using the outputs and services furnishable by the essential intermediate units to cover 80 % of their potential requirements as determined by "normal" technical production coefficients for medium to small industries with a non-vertical structure. These technical coefficients are arrived at by adjusting those obtained for the selected main lines of manufacture since they reflect not so much the present production structure of existing engineering industries in the pole but rather that which will presumably come into existence under the stimulus of planned industrialization of the area.

The inputs required by this group of units from the essential intermediate units is likely to be as follows: approximately 1 320 t cast-iron of various types, 590 t cast steel and 55 t of non-ferrous castings to be supplied by subsidiary foundries; 407 t forgings and pressings from subsidiary forges; 115 t and 165 t of miscellaneous items respectively required from subsidiary machining shops and metal-forming shops; 133 t gear members and approximately 396 t miscellaneous nuts and bolts to be provided by the appropriate intermediate units; 385 t of heat-treated and galvanized stock obtained in all cases through the appropriate specialized works. To meet the needs of maintenance, repairs and refit, etc. the various auxiliary units will work or process approximately 23 t of tools and patterns, approximately 11 t castings and forgings, give special treatments to some 10 t material and execute more than 13 000 hours of maintenance and service work on plant, machinery, vehicles, conveyor equipment and storeroom installations. When calculating the direct demand for inputs from essential intermediary units, it was assumed that maintenance and repair units would service not only engineering firms but also units belonging to other branches of industry in the pole and, therefore, within their radius of economic use. Various mining industries and a large number of manufacturing industries (food and similar, textiles, clothing, wood, paper, rubber, non-metalliferous minerals, etc.) have plants and machinery, vehicles and conveyor systems and storeroom equipment requiring maintenance which could be handled by the maintenance and service units planned for the complex. In view of the fact there are already several plant maintenance and service units in the area that work for the above-mentioned industries, the figure for demand on intermediate units to be set up in the area does not include this type of work on behalf of other industrial sectors. On the other hand, it is appreciated that with the creation of machinery maintenance and service units a gap in the present demand will be filled. The maintenance inputs required by units in other industrial sectors in the pole have been determined, within the aforesaid limits, on the basis of coefficients calculated by reference to the value of production for each class of industry and an estimate of maintenance handled by outside firms.

The inputs concerned have been estimated at approximately 20 000 hours maintenance, including some

(1) Also engaged in the field of precision engineering; constructs pneumatic, electrical and electronic control apparatus (whose gross value has not been included in the data listed above).

13 000 h for the various classes of machinery, and approximately 3 t of material for auxiliary heat treatments.

As regards the demand on essential intermediate units of the complex from units situated outside the pole it has in principle been decided to exclude demand affecting the auxiliary units (maintenance units, etc.) whose radius of economic use is comparatively limited; account is taken only of the part of such demand which affects subsidiary units able to operate at longer range.

It is therefore estimated that some subsidiary units will direct part of their overall production (varying from min. 2 % to max. 25 %) to engineering concerns outside the pole (within the principal region itself and adjacent regions). This appreciation likewise allows for the fact that the southern regions have a demand for work and materials that is not at present met by subsidiary units. The said services would be limited to meeting only part of the external demand in question since it is reasonable to suppose that not all types of manufacture could conveniently be handled by sub-contracting units situated beyond a certain distance (which is easier, for example, in the case of components not subject to frequent modifications and/or when the demand refers to a limited range of such items for which continuity of contact is not therefore indispensable). In other cases it is evident that main units outside the pole, which must obtain supplies in any case, may well turn to the Central-Northern industrial centres and not necessarily to the factories of the pole area.

As may be seen from Table 4.2.5-I the subsidiary pole units concerned with external supply would be the foundries, forges, machining shops, bolt-making works and special treatment units. The material breakdown would be over 2 115 t gray cast-iron castings, 400 t malleable and special cast-iron castings, approximately 100 t non-ferrous metal castings, over 400 t forgings, 170 t machined articles, approximately 275 t miscellaneous nuts and bolts, 92 t of heat-treated material and 67 t galvanized material.

Finally, with a view to integrating the direct demand arising from current operational needs (production and maintenance) consideration was given to the possibility of certain capital inputs being provided by various intermediary units. This applies to the tool- and pattern-making units which can not only repair, modify and service patterns, tools and accessory equipment but can also make production apparatus. These inputs are not essential as regards geographical proximity between supplier and customer: their inclusion merely reflects the objective fact that when units in the pole have to renew such equipment their lists of possible suppliers will include these tool- and pattern-making works in the pole as well as firms elsewhere in Italy or abroad.

In estimating these capital inputs it is assumed that less than 50 % of requirements for renewing tools and patterns (as determined on the basis of their average service life which is in turn dependent on type of product and frequency of type modification and/or replacement) would be covered. The remaining orders would be given to tool- and pattern-making units in existing major industrial centres.

It should be noted that production of new tools and equipment may be expected to start in earnest 5 years after the complex begins to operate, i.e. roughly during 1973-74. The construction of new tools and patterns by the specialist units concerned would represent from about 20 % to over 70 % of their planned production. Such units would however be working at almost full capacity, as in previous years, because their finished products will find a market among units already existing or in course of completion but above all amongst those outside the area.

From 1973-74 onwards supplies to outside would be gradually reduced in order to meet the growing demands from within the pole itself and especially from the new main units established there.

Table 4.2.5-II shows the average quantities of new tooling and patterns that will be required each year from the respective specialized intermediate units by the pole units (main selected units in course of completion or already existing and other intermediary units of the complex) and by units situated outside the pole itself.

The tool-making shops for machining and assembly would make new production apparatus to a total of 224 t, the tooling shops for metal-forming would cover almost 50 t and the pattern-making shops a little less than 5 t. Approximately 45 % of deliveries would be to external units.

SUMMARY OF DIRECT DEMAND FOR ESSENTIAL INPUTS FROM INTERMEDIATE UNITS OF THE COMPLEX

Overall direct demand has been arrived at by totalling, under separate items, the current inputs required from essential intermediate units by selected main units in course of completion or already in existence, and by other sources, such as industries located in the pole but not belonging to the sector, outside industries which might find it expedient to obtain their supplies from some of the pole's intermediate units and, finally, capital demands, limited to tooling-up and pattern construction. The data relevant to these component demands are scheduled in the preliminary Tables 4.2.5-I and 4.2.5-II and recapitulated first in the appropriate columns of main Table 4.2.5-III and secondly in the form of a general survey (graph 4.2-2 at annex).

An overall review of the data concerned shows that the following quantities would have to be supplied:

a) For maintenance, etc.: the tooling shops approximately 410 t (of which 340 t for machining and 62 t for metal-forming); pattern-making shops 6 t; special-

ist units for plant and machinery maintenance and service, over 160 000 working hours; auxiliary foundries and forges 60 t of iron castings, 4 t steel and non-ferrous castings, 12 t of forgings; auxiliary heat-treatment units over 82 t.

b) For production : the auxiliary foundries over 8 560 t gray iron castings, 3 250 t malleable and special quality cast-iron castings, 2 606 steel castings and nearly 760 t non-ferrous castings; subsidiary forges 4 176 t forgings and pressings; subsidiary machining and metal-forming shops (heavy, medium and light) 2 045 and 13 820 t respectively of sundry articles; gear-cutting plants approximately 2 036 t of products; subsidiary heat-treatment and galvanizing units 2 655 and 360 t respectively; bolt-making shops approximately 3 250 t of bolts of various types.

From these summary tables it can be deduced *inter alia* that the selected main units should account for between approximately 70 % and over 90 % of the total direct demand.

Regardless of the somewhat limited contribution made by existing industries and those in course of establishment to the total demand upon essential intermediate units it was nevertheless considered expedient to devote a fair part of the analysis to this aspect of demand. This was in order to bring to the fore some of the criteria, general methods and basic aims of the present study. Any exercise to determine the demand that may be counted on by the intermediate units due to be created in a pole must take account of the quantities, varying from area to area, that will be taken by factories already in operation (in a study which, unlike the present one, is concerned not with the creation almost *ex novo* of an industrial centre but with the modernization and diversification of an existing centre this contribution may be very substantial). Moreover the main aim is not to create essential intermediate units in a pole for the sole purpose of serving the constituent main units which together with them form the projected complex but rather to furnish the whole sector, now and even more so in the future, with activities designed to establish throughout the area operating conditions typical of a major industrial concentration.

4.2.6 CALCULATION OF INDIRECT DEMAND ON ESSENTIAL INTERMEDIATE UNITS

The demand on which essential intermediate units can normally reckon comprises not only the direct demand from main units and other sources but also the indirect demand created by the said intermediate units' own requirements, arising from input-output interrelationships.

In order to meet the needs of customer units (main units, subsidiary bolt-making units and foundries and suchlike for "miscellaneous" tools only) the toolmaking shops for machining require (apart from "raw" materials) iron castings, patterns (for supply to auxiliary foundries), welded products, forgings, heat treatment, gearwheels and bolts. They also require materials for the maintenance of their own plant and machinery (1), the services of units specializing in the maintenance and overhaul of plant, warehouse equipment and vehicles (toolmaking shops carry out all maintenance and service on their own internal machinery with their own personnel).

Assembly toolmaking shops require (apart from various "raw" materials) welded assemblies, forgings, nuts and bolts, materials for maintenance of own installations and machinery, which latter requirement is met in the same manner as by the toolmaking shops for machining.

The toolmaking shops for metal-forming work, first, for main units which loan the hot and cold dies, chills, etc. to subsidiary forges, metal-forming and non-ferrous foundry units and, secondly, for the said forges, in respect of their own requirements, and for the bolt-making shops (cold-heading). For their work within the context of requirements for the intermediate units here considered they need iron castings, patterns, welded products, forgings, heat-treatment and nuts and bolts. Their maintenance and service requirements are similar to those of the other types of toolmaking shop.

Insofar as the inputs covered by the scheme are concerned, the pattern-making shops do not require materials for maintenance nor the services of maintenance and service units.

The maintenance and service units do not require inputs from other intermediate units to enable them to carry out their own duties within the framework of the present scheme except for heat-treatments and materials to cover their own maintenance requirements.

The welding units do not require inputs from other units embraced by the scheme to enable them to execute their tasks on behalf of the toolmaking shops except as regards maintenance materials and appropriate services from the maintenance and service units (2).

The auxiliary foundries (meeting the requirements of the toolmaking shops and providing maintenance material for all units) and the subsidiary foundries (providing castings for the production lines of main units and of subsidiary machining units) utilize the following inputs: "miscellaneous" tooling made by the toolmaking shops for machining (auxiliary iron

(1) The materials for plant and machinery maintenance for both main and intermediate units generally refer to iron, steel and non-ferrous castings and the corresponding patterns, to forgings and the corresponding heat-treatments, to gearing and bolts etc.

(2) The welding units use standard (i.e. commercial) and not specific equipment so that they have no need of inputs from the toolmaking shops.

and steel foundries) and materials for own maintenance (1).

The auxiliary forges which work for the toolmaking shops and to meet maintenance requirements (provision of materials) and the subsidiary forges which contribute to the production of the main units and subsidiary gear-cutting units receive inputs from toolmaking shops, inputs of maintenance materials and external maintenance and refit services, the latter for warehouse equipments and vehicles only.

Under the scheme here adopted, the auxiliary and subsidiary special treatment units—the former operating on behalf of the toolmaking shops and for maintenance (materials), the latter on behalf of main units, subsidiary machining units (excluding gear-cutting plants as regards heat-treatment) and bolt-making shops—require inputs from toolmaking shops in the form of maintenance materials. They carry out all their own maintenance, except for plant and possibly also for warehouse equipment and vehicles.

The subsidiary machining units require, in addition to inputs from primary units, supplies from subsidiary foundries and forges, heat-treatment and galvanizing units and the appropriate toolmaking shops. Similar inputs are required by the gear-cutting plants except for heat-treatments which they handle themselves. The subsidiary metal-forming units do not have inputs from the tooling shops for metal-forming since in the scheme here considered these are assigned to main customer units. All these sub-contracting units require maintenance materials and services from the maintenance and service units.

Finally, the bolt-making units which cater for main, auxiliary and subsidiary units have inputs from machining and metal-forming toolmaking shops and units providing maintenance materials; they also require the services of specialist maintenance and service units.

The input-output data for the essential intermediate units appearing in the present definitive report have been extracted from the relevant feasibility plans. For each such unit they are therefore based on specific analyses which take full account of their respective operating requirements (in fact, thanks to these plans, the input figures for production and maintenance materials are available but are not given for the sake of brevity, as in the case of the selected main units).

During the selection process, when the plans had not yet been drawn up but it was nevertheless necessary to know *a priori* the indirect demand of the main units or that deriving from interrelations between intermediate units, special methods had to be used to calculate the said levels of demand even if only approximately. This information was needed because the demand from main units for the products or services of some essential intermediate units involves substantial production in other intermediate units, with considerable variations depending on the industry from which the supplies originate.

As with the methods used for preliminary calculation of the direct demand on essential intermediate units from main units, it would seem equally advisable to give a short description of the methods here employed for determining the indirect demand, as they may well be required again when similar research is undertaken in future.

In particular, the preliminary estimation of the inputs-outputs of the essential intermediate units did not present any difficult from the standpoint of determining the technical coefficients, as happened in the case of the main units; what did prove difficult was the choice of a suitable method of estimating which would not involve complex calculations hardly justifiable by the practical results to be obtained.

By their nature, and subject to certain variations in size, the essential intermediate units of the pole sector considered, i.e. auxiliary, subsidiary and bolt-making units, in fact have a similar structure as regards plant, machinery and production processes; as a result we have input coefficients which do not vary widely within the same size category. This is not so for most of the main factories in operation, which may require widely varying production apparatus and different input coefficients even when their output and product range are the same. It follows that the internal statistics of the latest auxiliary, subsidiary and similar units operating in major industrial concentrations can in principle be used direct in view of the relative standardization of such units, at least for those within the same size range, as already noted.

Seeing that, under the present scheme, transactions between main (terminal) units and essential intermediate groups are by definition in one direction only, i.e. the latter supply certain inputs to the former, while circular input-output relationships are confined to the intermediate units themselves, it seemed reasonable to devise a matrix restricted to the latter interrelationships and formed directly from the technical input coefficients corresponding to the product (material or work) of each type of intermediate unit covered by the scheme.

It was felt that by "inverting" the said matrix it would be easy to establish, on the basis of the predetermined demand of the principle lines, what level of output the said direct demand and indirect demand would provide for the essential intermediary units. Such an inverted matrix had the special advantage that, during the selection process, it was possible to determine the direct and indirect effects of including or excluding one or more principal lines, in or from the complex, on the output of the intermediate units covered by the scheme.

(1) Patterns do not appear in the scheme as foundry inputs since they are obtained from the customer units to whose account the castings are made. Patterns are supplied on temporary loan as/when required. As already stated, non-ferrous foundries are not shown as receiving inputs from toolmaking shops for metal-forming (chills) for similar reasons.

In practice however there was the difficulty that, as defined and quantified, the main-line inputs constituting final demand corresponded to generic intermediate products forming a heterogeneous aggregate unsuitable for the preparation of a matrix.

In order to obtain a matrix offering practical results it is not sufficient, for example, to sub-divide the toolmaking shops for machining into large, medium and small. In order to relate the technical coefficients correctly to products which are really homogeneous, a classification into sub-types allowing for the various materials required is necessary.

Large machining tools (constituting the generic product of the corresponding standard intermediary unit) may, depending on the type of work on which they will be employed, incorporate castings and/or welded members and/or forgings and/or nuts and bolts and/or gearing and may furthermore require heat-treatment. Consequently we should distinguish at least 10 sub-types of such tools if we are to be able to work with acceptable technical coefficients. The same reasoning applies to medium and light machining tools. There are likewise some 40 sub-types of tool for metal-forming and 10 for assembly. We must furthermore distinguish 2-3 sub-types of maintenance materials for each class of plant and machinery.

To sum up, the matrix for the system of essential intermediate units ought to have comprised more than 100 columns, which would not have constituted any real obstacle as regards the technical coefficients (see earlier remarks) or from the standpoint of calculation (inversion carried out by electronic computers). The difficulty which does seem insuperable arose rather in connection with its utilization. In fact, it was impossible to obtain the final demand data essential for this purpose; when selecting the main lines it was impossible, without the projects, to determine data of such a detailed nature concerning the essential inputs of these units.

On the other hand, to consider merely a smaller matrix covering generic products of each type of intermediary unit would have been tantamount to supposing that the technical coefficients were derived from weighted averages of technical coefficients for the component sub-types whose weights would have reflected a predetermined structure of main line demand for input sub-types. The aim being to analyse the effect of including or excluding one or more lines on the level of the various standard intermediate units it had to be accepted that this structure would suffer modification, with a consequent need to change the average technical coefficients, before proceeding to a fresh inversion of the smaller matrix without, however, possessing the elements necessary for such changes.

As dictated by the actual availability of data, it was finally decided to use a smaller matrix of 40 columns covering generic products of the essential intermediate units of the scheme, thus accepting the limitations imposed by using average technical coefficients derived from weightings based solely on very approximate estimates. However, it was decided not to invert the matrix but rather to proceed to a simple incremental solution confined to the first three iterations. On the basis of the final or direct demand (constituted by the various types of staple inputs of the selected main units, projects in the course of completion, projections for existing industries etc.) we thus obtained the levels of total demand for each type of intermediate unit in the system.

At this point, still during the process of selection, it was found necessary to make a first comparison between overall demand levels and those required for the individual types of intermediate unit to be of economic size (for ease and clarity of lay-out the compatibility of demand with economic size will be discussed in the next section 4.2.7 of this report). To cover cases in which demand was found to be less than supply, we tentatively chose, as previously mentioned, from among the "reserve" main lines (as determined during the second stage of the selection process with margins for inclusion) those which by their nature required high inputs from such types of intermediate unit and inserted them in the scheme. Observing that it is not always possible to balance such supply and demand requirements without creating new imbalances, nor for market and other reasons to raise the production of the main units already selected and hence the inputs in question, we were compelled to resort to combined types (see 4.2.7) for some kinds of intermediate unit.

Having adjusted the coefficients of several intermediate products by means of the said inclusions on the basis of the new direct demand we proceeded to reprocess the matrix solution by iteration.

On the other hand, as already stated, the data presented in table 4.2.5. - III giving the indirect demand (which together with the direct demand constitutes overall demand) refer in the present definitive report to the results of the individual feasibility projects. It should also be noted that in the final determination of indirect demand it was no longer necessary to resort to a genuine matrix. By the time we had finally processed the feasibility projects for the main units and preliminarily processed those for the subsidiary units we had acquired nearly all data of the demand relating to auxiliary units. Input-output relations at this point were finally determined by arranging the data suitably in a double entry table.

The results from this table clearly show that the volume of interexchanges between these intermediate units reaches fairly high levels, at least for certain products and types of work.

Whilst the indirect demand on the toolmaking shops is 26 t as against a direct demand of 409 t the figures for patterns are 23 and 6 t respectively. For maintenance and external servicing the indirect demand is

for 70 000 hours and the direct demand 161 000. The structure of the system examined is such that the overall demand for foundries consists almost entirely of direct demand: for forges on the other hand indirect demand is of the order of 1 600 t (as against a direct demand of 4 167 t). Again in accord with the structure of the system considered the indirect demand relating to subsidiary machining and metal-forming units is negligible or even nil: this is also true for bolt-making. In the case of heat-treatment there is an indirect demand of 500 t as compared with a direct demand of approximately 2 655 t; for galvanizing treatments the figures are 490 and 360 t respectively.

It is furthermore clear that the demand on supplementary units from the toolmaking shops and for maintenance is in most cases wholly indirect: welding shops 68 t, auxiliary foundries 105 t, auxiliary forges 32 t and auxiliary treatments 164 t.

For more detailed information on the interrelations between the various types of intermediate unit please refer to graph 4.2-3 at annex.

4.2.7. COMPATIBILITY BETWEEN OVERALL DEMAND AND ECONOMIC SIZE OF THE ESSENTIAL INTERMEDIATE UNITS DEFINITELY SELECTED.

The total demand that can be counted on by the essential intermediate units to be set up in the pole was checked by type of unit to establish whether it was sufficient to support one or more such shops of economic size.

"Economic size" is determined by minimum outputs allowing competitive prices i.e. costs of the same order as those of intermediate units of the type considered which, even if not on the largest scale, nevertheless operate economically in the industrial concentrations of Northern Italy. This is necessary so that all main and other client units in the pole can obtain auxiliary and subsidiary products at prices no higher than those charged in the North.

It must be realized however that economic size cannot be defined in simple or absolute terms; for any given type of unit it will depend on the prevailing composition of the customer units' demand. If we consider for instance a medium-size, subsidiary metal-forming unit which predominantly processes stock of fair thickness (3 mm) and another engaged mainly in working light sheet (0.7 - 1.2 mm) we find that their respective capacities may well be 18 000 and 6 000 tons p.a. Similarly a galvanizing unit dealing mainly with nuts and bolts requires a minimum output of 800 t/year, which will be reduced to 400 t/year if plate and sheet products are mainly handled.

When deciding on the number and size of the essential intermediary engineering units to be set up in the pole, account also had to be taken of requirements arising from possible alternative solutions. Our prime general criterion was, whenever possible, to have more than one intermediate unit of the same type in order to promote competition, and allow some flexibility in the completion dates for the integrated complex of industries proposed; flexibility was also necessary to provide for the eventuality that in a first stage of pole development it might be decided to base the heavy and medium engineering complex on two centres (say Bari and Taranto) rather than on one only as would at first sight seem best. On the other hand, in some cases, where demand appeared capable of supporting several units of the same type, we decided to limit the number in order to reduce the difficulty of promotion and guarantee dimensions above the minimum.

The results presented in this section give preliminary confirmation that it is technically and economically possible to specify, for the promotion of an industrial pole, a reasonable number of enterprises provided with their essential intermediate units and reflecting the productive systems of the most advanced regions of the EEC. This possibility becomes viable if we admit a degree of specialization that is not too advanced for some types of auxiliary and subsidiary unit, together with several particular solutions that must obviously be imposed at an early stage of the development process.

We must here reaffirm (see 4.2.6.) that when preparing this study the preliminary results of this section were very different from those which now appear. The balance between demand and supply for the individual types of intermediary unit was arrived at by various approaches, especially on the demand side (inclusion of new main lines, exclusion of others, etc.) each of which posed its own problems and demanded its own solution. The discussion which follows does not analyse these various approaches, but serves to give an idea of the difficulties that we had to contend with.

Table 4.2.7 - I shows the overall annual demand originating in the pole on which the various types of intermediate units in the sector can rely and compares it with the minimum economic size of each type of unit. The latter is sometimes expressed as two figures between which the actual value may fluctuate: the first is the lower limit below which economic viability is generally considered impracticable whilst the second approximates to, though it may not coincide with, the most competitive, or optimum size.

Study of the data in this table shows, as expected, that the demand of a minimum complex such as that formed by the main units of the pole (plus projects in hand and existing industries) could not support a system of auxiliary and subsidiary units modelled on the criteria of the highest degree of specialization to be found in large industrial concentrations of the EEC.

Of the 40 types of intermediate unit considered, almost half would not reach the required minimum size if the said criteria were rigidly applied. Even if

the number of main units to be created or the production levels of those preselected were increased fivefold (which would be very problematical owing to lack of skilled labour, market limitations, etc.) this would still be insufficient to raise the total demand to the necessary level.

It was therefore deemed expedient that the final selection of essential intermediate units for the complex and the relevant planning should be concentrated on units of combined type and appropriate productive structures currently operating in the aforesaid major industrial concentrations (see 4.2.4.).

Table 4.2.7 - II compares overall annual demand on the essential intermediate units of the area with the minimum economic size for different types of combined unit. With this new structure, estimated overall demand "balances" the required levels of supply for all types even though for some intermediate units, especially the toolmaking shops, demand barely reaches the lower limit for minimum size, As already noted, although the capacities may be considered economic they involve production costs slightly higher than those attainable by corresponding single or combined units of optimum size.

Quite obviously the decision to plan intermediate units of combined type was only taken after possibilities had been explored of increasing the relevant demand by including further main customer units in the complex. In order to do this without invalidating the criteria used in the previous selection studies we reviewed all the main lines (not excluding market factors nor disregarding other factors such as excessive degree of labour specialization, territorial specialization of other poles in the South, etc.) (1) which showed the highest figures for inputs affecting the intermediate units concerned. By this means we determined how much demand would have been increased by introducing these main lines into the complex with production levels on a par with those of the largest Italian factories in the branch. The results show that in nearly every case the problem for the said types of intermediate unit would have arisen just the same.

To overcome problems arising from the creation of certain types of toolmaking shop the productive levels of the user units in the pole would have to be increased approximately tenfold in terms of demand.

To take the particular case of the toolmaking shops for heavy machining, an annual level of total demand of approximately 50 t is set against a capacity of 550 to 800 t. Disregarding the manufacture of motor-scooters, motorcycles, etc. (385/a), office machinery (362/00) and railway rolling stock (382/00), previously excluded for various market reasons, only the manufacture of textile machinery (364/11) and suchlike remained among the reconsidered lines with high input technical coefficients. Apart from the considerable requirements of such production lines for specialist labour, their inclusion as new large units in the pole would have raised total demand by approximately 100 t, to less than 1/3 of the requisite dimensions.

Likewise for the tooling shops for medium machining (140 t demand against capacity of 180 - 280 t) it was for market reasons impossible to propose further new main units such as the manufacture of office machinery (362/00), sewing machines (364/20), motor-scooters and motorcycles, etc. (385/a). Even disregarding the reasons which had previously led to exclusion of the manufacture of hardware (355/30), textile machinery (364/11), printing equipment (368/2c), special pumps (369/3b), compressors (369/3c), non-industrial taps and cocks (369/86) and scales (369/9b), inclusion of these lines, even though offering considerable inputs to the said toolmaking shops, would only have increased total demand by about 25 - 30 t/year.

It therefore became necessary to base our project planning on the establishment of a combined tooling unit for heavy and medium machining. Calculations confirm that it is technically possible to build such a unit with a capacity of about 200 t and unit production costs not more than 5 % higher than those of units of optimum size. This supplement would be reflected in the manufacturing costs of the finished products of the user units to a maximum degree of 0.05 % which can be considered as negligible for such a fundamental development of a type quite new to the area.

For the shops making assembly and welding tools, a capacity of 80 - 100 t is set against a demand of 8 t in the pole. Disregarding construction of motor-scooters, motorcycles, etc. (385/a) and bicycles, powered bicycles, etc. (385/b), already discarded for market reasons, we calculated the additional demand that would result from the inclusion of a unit for making metal furniture (355/6a) and one for making refrigerators and washing machines (376/a) even though the latter belongs to the electrical engineering sector. This additional demand would only be 15 t. For the erection-work tooling shops (capacity 60 to 80 t against a demand of 4 t) no main unit could be found having high inputs of this kind and lending itself to possible subsequent incorporation in the complex (2).

(1) The re-examination did not cover lines excluded by criterion 1, i.e. motor vehicle construction, shipbuilding etc., nor obviously those covered by criterion 6 in respect of projects in hand and major developments in the pole area observing that these latter lines were already included in total demand.

(2) Main lines with higher inputs for such tooling shops, other than those already included in the complex, would be the construction of motor-scooters, motorcycles, etc. and office machinery though, as already mentioned, serious market limitations militate against the establishment of such units. Moreover, for some lines such as motor-scooters the complexity of the assembly tools and equipment is such as to prohibit its inclusion within the quality range of the toolmaking shops in question (see remarks on toolmaking shops for complex production apparatus).

Observing that these two types of assembly-tool workshops require machinery which is practically the same as that for the toolmaking shops for light machining, the possibility was checked of including such activities in combined units designed appropriately for the purpose. Adopting this solution the unit costs for processing work on assembly tools should theoretically be slightly higher (1 %) than those of optimum units and should have practically no effect on the total production costs of the customer units.

In the case of the tool-making works for medium metal-forming (demand approximately 40 t against unit capacity of 180 - 300 t) the hypothetical inclusion of other main user units such as those constructing metal furniture (355/6a) and textile machinery (364/11) ([1]) would in any case only have increased demand by 5 t. Seeing that these toolmaking shops may also be entrusted with the repair (not the making) of heavy metal-forming products (except cast-iron baths (355/7d), already discarded for market reasons) no other likely possibilities came to mind. Outside the sector, in the electrical engineering field, the possible creation of large units producing refrigerators and washing machines would have raised this demand by no more than 15 - 20 t.

In this case also, the solution was to design a single toolmaking shop for medium/light metal-forming with a productive level of over 60 t. With common plant and a minimum of machinery specific to medium forming work, the mean unit cost would be 5 % above that for optimum size but would raise the costs of the products of user units by a maximum of 0.02 %.

The problem of insufficient demand for the machinery maintenance and service units (i.e. less than half the necessary supply) could obviously not be resolved by including new main units in the sector. Bearing in mind the particular initial conditions of the pole here considered (and encouraged as already mentioned by the precedent of similar units already existing in Northern Italy and other major concentrations) the most rational and economic solution was deemed to be the creation of combined units with personnel and equipment adequate for meeting all maintenance and service requirements for every type of plant and machinery.

It should be noted that although there is a sufficient total demand for units maintaining and servicing transport and warehouse equipment, they are not to be planned or promoted since such activities are already catered for in the pole area. External maintenance of transport and handling equipment is already covered by a number of local repair shops run by the agents or licencees of firms manufacturing fork-lift trucks, conveyors, electric locomotives, motor vehicles, etc. and an adequate service is additionally offered by various service workshops. As regards warehousing and storage equipment (which comes within the vast sphere of light metal structural work) various units already operating in this line of country are in a position to offer every assistance. Similarly, in the case of the welding units, for which a sufficient level of demand would not be reached, some of the many units already active in light metal structural work could well carry out welding assembly jobs on behalf of the toolmaking shops. This would simply require the employment of a man qualified for the particular work required.

The difficulty arising from the insufficient demand for single castings (for the requirements of toolmaking shops and maintenance) in steel and non-ferrous metals (2 and 3 t against 130 - 220 t and 50 - 90 t respectively), which prevented the creation of specialized foundries for these two types of work, have been overcome by planning all the subsidiary foundries (including the iron foundry) with an auxiliary section (and pattern section as described later) : steel and malleable cast iron foundry, gray iron foundry, non-ferrous metals foundry. It should be noted that the planning of a single foundry for malleable cast iron and steel is not dictated by reasons of equilibrium between demand and supply but by technical-economic considerations in that it is expedient, within certain production levels, to have mixed plants which will also be capable of producing special cast irons for which there might be a growing requirement from units eventually situated in the area.

Similar difficulties were encountered (total demand 43 t against minima of 50 - 70 t) and a like solution adopted for the forgings destined for toolmaking shops and maintenance; the subsidiary forging units were accordingly designed with an auxiliary section.

When comparing the minimum economic size of auxiliary and subsidiary foundries and forges with those of the respective combined units (subsidiary with auxiliary section) it can be seen (see Tables 4.2.7-I and 4.2.7-II) that the latter's dimensions are practically equal to those of units solely engaged in subsidiary activities. In point of fact, castings for tooling shops and maintenance can be made by the lines turning out short-run light subsidiary products, etc. in such units, alongside the lines for long- and medium-run subsidiary products. For forging units, the forgings representing auxiliary demand should be handled by the works' own plant though the shop arrangements may be included in the general operational complex of the combined subsidiary unit.

The decision to combine the pattern-making units as sections of the foundries (even if demand were sufficient to justify creation of a separate unit) is in accord with current trends in major foundries. Such an arrangement ensures fuller utilization of the machinery installed for internal maintenance, by enabling it to be used also for work in connection with pattern-

([1]) Motor-scooters, motorcycles, etc. and sewing machines have been left out of consideration as they are excluded by market considerations.

making and at the same time secures closer contact between pattern-making and casting activities.

As regards other types of sub-contracting work, the unit for heavy machining is the only one with a demand lower than minimum economic size (140 t against 400 - 500 t). Here again our first line of action was to estimate the amount by which demand could be raised by establishing in the pole units with high inputs of this class, which had been excluded by virtue of various selectional criteria other than market factors: construction of various types of civil engineering machinery (366/4c), etc.; large compressors (369/3c) and, outside the boundaries of the sector considered, manufacture of refrigerators and washing machines (376/a), polishing machines and vacuum cleaners (376/b), etc. Such inclusion would have produced a marked increment of demand, varying from 100 to 150 t, depending on the production range of the individual units but still insufficient to reach the dimensions required by the units concerned. Our calculations showed that the solution of a unit combining sub-contracted medium machining work with heavy machining work and a total production level of 310 t, would entail unit production costs at most 1 % higher than those of a combined unit with optimum dimensions.

An analogous solution was arrived at for the sub-contracting unit for heavy metal-forming (4 739 t demand against capacity of 10 000 t) which was combined with its medium counterpart. It should be noted that this is the only type of unit for which, if we were to disregard specialization links with other poles and the complex were not limited to heavy and medium mechanical engineering, it would have been possible to make good the lack of demand by establishing in the pole, for example, two large refrigerator and washing machine units which would together have contributed an additional demand of 10 000 t. Quite apart from the said existing links and, in the medium term, the adverse market effects of excessive supply from large factories already in existence or under construction, a solution of this sort was not considered because the one previously chosen involves unit costs for heavy metal-forming work which are theoretically only 3 % higher than those for a heavy metal-forming unit of 10 000 t or more or of a combined heavy/medium metal-forming unit with a total production of at least 15 000 t. We say "theoretically" because there are very few subsidiary units of this kind in Northern Italy serving limited zones and none at all in the South.

In the case of the heat-treatment units, if the pole is provided with modern plants expressly designed for limited outputs (say 1 000 t/year) and able to treat heterogeneous short- and medium-run products, such as would in fact comprise demand in the area during the initial stage, no problems of size would arise and it would on the contrary be possible to set up two units of this type. In view of the operating conditions of such plants, auxiliary and subsidiary heat-treatments have been combined. The difference in unit production cost between plants of 1 000 t and those of 10 000 t is less than 10 % and the incidence of this on the production cost of the finished products would be negligible.

It should be noted that the gear-cutting unit will handle the heat-treatment of its products with its own internal equipment; this is done for technical reasons i.e. to obviate the possibility of materials being damaged, especially during transport prior to heat-treatment (1).

Finally, although the total demand may in general be sufficient for the economic capacity of the various types of bolt-making works it is nevertheless considered more efficient for the pole to combine all these types of work in one single unit; as already noted, this is current practice in existing major industrial concentrations.

The system of essential intermediate units finally selected as feasible in the pole is summarized in Table 4.2.7-III. It covers all the requirements of the selected main units and generally of heavy and medium mechanical engineering. Through not offering for some types of unit the highest degree of specialized production encountered in the more industrialized zones of the EEC, this system is no less complete in terms of supply. In comparison with Northern Italy it even shows certain improvements in that it can count on some types of unit such as gear-cutting plants and specialist sheet metal-forming units which are not encountered in the industrial triangle.

As finally selected, this system closely observes the stipulated general directives, even though we have to recognize the impossibility of allowing two units of each type in the case of auxiliary toolmaking shops for heavy-medium machining and medium/light metal-forming and subsidiary heavy and medium machining units, metal-forming units, heat treatment units and non-ferrous foundries. In some cases the decision to establish only one unit per type has on the contrary been deliberate, e.g. for the gray iron foundries, steel and malleable cast iron foundries and forging works: this is a realistic approach since we must remember that the area already contains factories which, if suitably modified or expanded, could well constitute the corresponding units planned for the pole.

(1) In any case, even if the gearwheels, etc. were treated in a separate nearby unit the total demand would only have reached 4 000 t which would not justify installation of a heat-treatment unit with long-run plant (10 000 t). As regards the inclusion of main units previously excluded it is considered that if several major units using heat-treatment were to be established, such as the construction of machine tools on a metal-forming basis (363/12), rubber and plastics processing machinery (365/30), printing machinery (368/2c), water and hot-air turbines (369/20), the demand would only increase by 1 200 t. User industries such as manufacture of motor-scooters, motorcycles, etc., sewing machines, etc. have not been considered for obvious market reasons.

4.2.8 COMPATIBILITY BETWEEN NUMBER AND TYPES OF SELECTED ESSENTIAL INTERMEDIATE UNITS AND POSSIBLE ESTABLISHMENT OF A COMPLEX DISTRIBUTED AT THE TWO ENDS OF THE BARI-TARANTO AXIS

In deciding on the location of the essential intermediate units to be created in the pole, the overriding consideration on strictly economic and technical grounds is that the whole complex should be established in the Bari zone in order to profit fully from the initial and other advantages of concentration, including, above all that of facilitating the creation of a labour market.

In the first stage, whilst retaining the ultimate objective of creating the Bari-Taranto industrial axis, specializing in mechanical engineering, the new development resulting from a direct promotional programme should be concentrated on the first terminal point and then later on Taranto, in pursuance of a fresh programme of similar nature (the planning and development of new main units could be undertaken in the immediate future and/or the projects of interested concerns channelled towards some other zone of the pole). It should moreover be remembered that Taranto, which already has a substantial metallurgical and engineering industry, including the IVth Iron and Steel Centre, and will soon have the backing of a modern system of essential intermediate units operating on behalf of the whole pole, at a distance of about 90 km (Bari zone), would be in a position quite independently to attract considerable new investments in the field of heavy and medium mechanical engineering.

This is also true of Brindisi, which is about 100 km from Bari. Although specializing in petrochemicals and its daughter industries supplying inputs to the mechanical engineering and many other manufacturing industries, this zone could, in a more advanced stage of industrial development and diffusion throughout the whole pole, also become the location of large mechanical engineering units.

It should once more be stressed in this connection that the determination, planning and direct promotion of main units in the pole area are not an end in themselves within the terms of reference of the present study but rather a means leading to the creation of essential intermediate units which will ensure, over the whole area, operating conditions similar to those in the more highly industrialized regions, and hence serving as a powerful magnet to attract new investments.

Bar exceptional cases, a distance of about 100 km is the economic radius of utilization for auxiliary and subsidiary units, particularly in an area which will have an efficient system of communications and transport. Among the auxiliary units, the tooling shops (repair work) can operate over this radius though a lesser distance, say 20 - 30 km, would be preferable. In the case of casual or periodic service and maintenance it would make little difference whether the user units were 100 km away or nearer to the service units; but for emergency services a distance of only 20 - 30 km would definitely be better.

For the subsidiary units which have relatively less need for contact as compared with the auxiliary units, there should be no significant differences as between the two radii of utilization.

In any case, if for social or generally non-economic reasons it were desired that the main and essential intermediary units due to be created in the sector by direct promotion should be shared between the two above-mentioned terminal areas or in two separate zones (though still within the pole) it would be important to remember that the division could not be arbitrary but would have to take account, first, of the productive structure of the main units and, secondly, of the type and number of intermediate units necessary and capable of realization.

For the express purpose of illustrating the factors and problems which would have to be considered if such a division were desired, a specimen breakdown has been made of the main intermediate units as between Bari and Taranto.

To this end the main units have been selected in two separate groups, one for Taranto and the other for Bari, taking account in both cases of particular similarities indicating their characteristic requirements (materials processed, similar processes, means of production, etc.).

The first group has been defined (apart from analogy of means of production) principally on the basis of materials processed, concentrating all outputs requiring a greater proportion of materials from the iron and steel industry in the Taranto zone. This of course takes account of the presence of No. IV Iron and Steel Centre and its possible future productions whilst recognizing that, for the present, some types of semi-finished products (cold-rolled plate, etc.) are not being manufactured.

The main units to be established at Taranto could be two in number, viz. unit I—Heavy structural metalworking and unit II—Manufacture of cookers, baths and radiators of sheet metal and metal hollow-ware. The remaining 6 selected main units (III-VIII) would be located at Bari.

Such regrouping would be acceptable for the distribution of intermediate units from the standpoint of both the direct and indirect requirements of the main units.

Indeed, considering the demand from the two main units indicated above for Taranto there would be little need for inputs from toolmaking shops for machining. Requirements would be limited for heavy structural metalworking and manufacture of sheet-

metal cookers and almost negligible for manufacture of hollow-ware, baths and radiators. While the existence of two toolmaking shops for light machining is justified in the pole there would seem no essential need to create one at Taranto in the initial phase.

The concentration at Taranto would however absorb a considerable part of the activity of the only toolmaking shop for metal-forming planned for the pole, in that it would concentrate all the productions predominantly employing pressed sheet and hence the greater proportion of the cold dies. On the other hand there would be a greater demand at Bari for repairs, alterations, etc. to chills for aluminium castings and hot dies for forgings, etc., which require more maintenance. Since it is not possible to establish two toolmaking shops of this kind, the one intermediate unit envisaged would have to be located at Bari.

Given that there would be two combined units for maintenance of plant and various kinds of machinery the size of the Taranto demand would justify one of these units being situated at that end of the axis.

Complementary tooling and maintenance activities would in general be located at Bari; according to the scheme here established these services would be provided by sections belonging to single subsidiary units as for the steel and malleable cast iron foundries, gray iron foundries, non-ferrous foundries and forging works. Another fact worth bearing in mind is that thanks to the natural gas pipeline at Bari the foundries and forges will be able to use this cheaper fuel. It should also be noted in connection with the said subsidiary units that the Taranto grouping would have modest requirements for production of steel, iron and non-ferrous castings and a negligible requirement for forgings.

The demand from the main units of the Taranto group for other types of sub-contracting work would justify the presence of one of the three subsidiary light machining units. The group would furthermore absorb nearly all the production of the subsidiary heavy/medium metal-forming unit (all the heavy work and a large proportion of the medium) which, as we have already said, would justify the unit being located at Taranto.

Regarding heat-treatment, although two such units are planned for the pole it appears from preliminary analysis inexpedient to site one of them at Taranto in view of the limited demand.

However, the bolt factory could well be located at Taranto. Indeed the hot-heading production would be almost completely absorbed by main unit I—Heavy structural metalworking. The demand for cold-heading and special bolt-making work would also be high. It must not be overlooked however that the bolt factory would also have to supply Bari with part of its cold-heading and special work and all its machining work which Taranto would only require for maintenance purposes. As a direct consequence of locating the bolt factory at Taranto the only galvanizing unit would also have to be situated there since the bolt-making unit is its principal customer.

A preliminary breakdown of the main and intermediate units to be established in the pole if it decided to base the complex on the two terminal areas (or generally in two different zones of the pole) is given in Table 4.2.8-I.

CHAPTER 5

Feasibility studies for the main, auxiliary and subsidiary units to be set up in the pole

It is not considered opportune to publish these studies at the present time, as they are still available from the EEC Commission and the competent Italian organizations (Committee of Ministers for the South, Cassa per il Mezzogiorno and IASM) for inspection by firms interested in implementing them in the area of the pole.

Nevertheless, their contents are briefly set out below, to show how far the report carries its analyses on these practical points.

Subchapter 5.1 of the report discusses the studies in general. In 5.2 the individual feasibility studies for the 8 main units selected are set out; whilst subchapter 5.3 includes the individual studies for the auxiliary and subsidiary units. There are 17 studies in all, since some of the 23 essential intermediary units are identical.

In addition to technical/economic and economic/financial considerations, the individual studies include an analysis of the commercial aspects already discussed in 4.1.8 (list of main units finally selected—market considerations and size of units).

The analysis of technical/economical aspects is presented, roughly, in the order in which the planning data were determined and calculated. Output and specifications of the products were first established and the most suitable processes and methods of processing determined from these. On this basis the machinery, equipment and specific plant required were defined, followed by direct and indirect manpower requirements for production and workshop (clerical) staff. Requirements of production materials were worked out from these figures, covering both inputs and stocks. Requirements of operating supplies (inputs and stocks) were determined in the same way. Fixtures and fittings and means of transportation required in the stores were then specified. General installations and inputs for services and utilities were defined in accordance with the above data.

It was then possible to estimate what provision would have to be made for maintenance and servicing of installations, machinery, etc., including both material and manpower for internal maintenance and services required for external maintenance and servicing. Maintenance of buildings and structures, etc., is based on the structures referred to in subsequent pages. All the necessary information thus being available, indirect manpower requirements for the general services were determined.

Administrative personnel requirements were then fixed, including administrative staff proper and technical staff. The necessary fixtures and fittings were also defined. As already stated, requirements as regards buildings, etc. were based on operational considerations fixed in advance.

For the sake of clarity, the analysis of manpower in the studies includes direct and indirect labour. It should, however, be borne in mind that the above sequence of technical/economic planning applies only in very broad outline; in practice, all the points mentioned were fully integrated owing to their close interdependence.

Particularly in the studies for main units, analysis of the technical/economic factors begins with a re-examination of the unit's output, which is converted into typical products representing all models and the entire range of products under consideration. This is followed immediately by a description of the processes and methods which determine the productive structure of the unit.

A list is given of general and specific machinery, stating the cost and average life of each type. There are similar lists of general and specific equipment (including gauges, control gear, etc.) and specific installations. Each installation is suitably described.

Production materials are analysed with technical coefficients and annual inputs (by weight and value) given separately for each typical product. Inputs are examined separately for each material, classified according to their origin from the various types of intermediary units. Required stocks of production materials, expressed in terms of normal working days' supplies, are given and assessed for each class of material. A similar analysis by type of product is given for materials in course of processing (specified and unspecified raw materials, finished materials, direct manpower) and by stores of finished products (at the factory or stored externally). Inputs and stocks of operating supplies are also given for each class of material.

The studies thus deal in detail with the fixtures, fittings and means of transport for the workshops and stores, setting out their purchase price and average life.

General installations are described according to their main characteristics and their costs and average life are assessed. This is followed by details of requirements of industrial and drinking water, electricity for industrial use and for lighting and natural gas.

The studies next analyse inputs and stocks of maintenance materials, as well as the size and annual cost of the labour force required for internal maintenance (by skills, in accordance with trade union categories). The costs of external maintenance are listed separately by types of auxiliary units providing such services.

As regards labour, the studies contain a large number of detailed tables relating to direct and indirect labour. Direct labour is analysed by class of products whilst indirect labour is subdivized into that employed on production, general services and maintenance. A special section is devoted to the recruitment and training of workers. Workers recruited locally (direct or through further and initial training courses) and those transferred from the parent company are analys-

ed by their various classes and categories. For the above-mentioned courses, the number of trainees, the duration and cost of the course and the cost of transferring "imported" workers are given.

An extensive analysis is given of structure and cost of administrative, technical and clerical staff. Special reference is made to workshop technical personnel and clerical staff, who are listed according to their professional categories; employees recruited locally (direct or through training courses) are distinguished from those transferred from the parent company. The cost of training and transfer is given.

Similar information is given for administrative and associated staff, and for managerial and executive personnel. The analysis of personnel ends with particulars of fixtures, fittings and means of transport for the administrative buildings and offices and their average life.

This section is followed by notes on the land necessary for the factory (strength, total area, including provision for extensions, costs, etc.) and on the various structures (premises for workshops, external stores and separate warehouses, other premises, offices, miscellaneous structures and additional works, etc.). The characteristics of all such structures and their location on the site (as required for the production equipment, materials flows, etc.), are given together with their estimated cost and average life.

The section dealing with the technical/economic aspects ends with an examination of the schedules for building and erection work for the factory, for the engagement of workers and training and for the commencement of production.

The economic and financial section begins with an analysis of investments by class of fixed assets (preliminary costs, land, buildings and miscellaneous structures, plant, machinery and equipment, fixtures and fittings, vehicles, initial organization and the associated sub-headings) and of the various components of floating capital (current assets and liabilities). Investments are evaluated in terms of their real cost (purchase cost, including basic cost, associated expenses, contingencies, plus interest incurred, less paid-up capital contributions), and as they would be without the incentives which are to apply to the Mezzogiorno. More detailed figures are given in examining the distribution of fixed asset costs over the period of building and erection. The means by which floating capital will be obtained during the factory's first years of production are also discussed.

Operating costs and returns and gross annual profit are given for each year during the initial period until the normal rate of production is achieved.

Operating costs include direct and indirect running costs, depreciation, overheads and interest paid; these general items are classified in a similar manner to that used in the technical/economic section. Costs and gross profits (before tax) are also compared with the figures which would be applicable without the incentives which reduce the depreciation charges on renewable fixed assets, other deferred costs and interest. The analysis of the anticipated results of running the factory ends with an estimate of net profits during the economic life of the factory; for comparison, the net profits as they would be without the ten-year period of tax exemption on company profits in the Mezzogiorno are also given.

There follows an analysis of the financial structure of the units: the relative proportions of capital outlay financed by the manufacturer's own capital, low-interest medium-term loans and non-repayable grants from the Cassa per il Mezzogiorno are discussed, as well as the terms and conditions applying in each case. This analysis examines the debt/capital ratio and the ratio of liquid assets to current liabilities. In addition there is a cash receipts and payments account for the years of building and erection and for each year of operation of the factory.

A special section is devoted to a comparative evaluation of the project and a similar one theoretically put into execution in the Italian industrial triangle, in the Milan area. Capital outlay and sources of finance are analysed for the two areas and the differences between them are pointed out. For fixed asset investments in particular, all the individual cost headings are compared, starting with the basic cost and associated charges (transport, etc.); taxes on purchases and interest during building are also taken into account. Each item of floating capital is also compared (all categories of stocks, accounts receivable and payable, etc.).

The comparison for the two locations of returns, costs, gross and net profits (net of tax), assuming a normal rate of production, makes it possible to assess the different results for all headings both individually and collectively. In this way it is possible to demonstrate how competitive the individual projects are, even excluding the exemption from Companies Tax in the case of Bari.

The contents of the studies for auxiliary and subsidiary units are very similar to those of the main units. On the commercial side, the market is, plainly, determined by direct and indirect demand from the main units planned, already existing and under construction. There is no difference in the technical/economic aspects. In the case of the economic/financial aspects, however, there is no comparison with an equivalent project in the Milan area, although the effect of the incentives on investment, costs and gross and net operating returns is illustrated.

Finally, it should be emphasized that the entire presentation of the studies—as regards content, classification and details—is expressly and primarily based on evaluation criteria of interest to manufacturers, rather than on the requirements of a general economic

analysis. These studies, although based on a specific amount of production equipment, a specific labour force with specified qualifications and on definite productive combinations for typical products, will provide firms interested in the industries concerned with all necessary information; these firms will, of course, be free to determine the structure and range of products of their factories as they wish. In this respect, it is also intended that the studies should be useful to firms in the principal engineering industries not dealt with in this report, who, anticipating good operating and market conditions, wish to set up works in the area of the pole, and to join in the establishment of the initial complex.

CHAPTER 6

General survey of plans and development prospects for heavy and medium mechanical engineering in the pole

6.1. GENERAL SURVEY OF THE INTEGRATED PLAN

6.1.1. INTRODUCTION

The most important data about the proposed units are given in the next three sections.

They should not be considered solely as the contribution made by the plans to investment, production, and employment in the region in the years under review; from the point of view of analysis they provide information of more general value indicating the minimum central nucleus of integrated units (main industries and their subsidiary and essential auxiliary units) capable of operating independently in the heavy and medium mechanical engineering sector. This independence does not refer to suppliers of raw materials from primary sectors (iron and steel) or of standard commercial products. In view of the low incidence of transport costs on total production costs (under modern conditions) and the fact that there is no need for permanent contact between client and supplier, it is not essential for satisfactory and competitive production that these primary and intermediary industries should be on the spot.

The results obtained can therefore serve as a guide for similar future projects in other outlying regions of the European Economic Community. They can be applied if we bear in mind that conditions vary and that the pole under discussion already has mechanical-engineering industries which are the equivalent, in terms of potential intermediary demand from the new productive system, to 10-20 % of the main units planned.

The integrated set of plans is a minimum, for which the component industries have been selected with the greatest care (see Chapter 4). The ultimate purpose is that the essential intermediate units (auxiliary, subsidiary, etc) which serve heavy and medium mechanical engineering in the industrial centres of more advanced regions should be set up within the pole. Since it is necessary to establish a number of main units with sufficient demand to maintain the activity of these intermediary units (which have size requirements), the easiest solution would be to propose the establishment of a group comprising many new main industries which would be certain of achieving inputs ensuring that all the component elements would be of economic size. A vast programme would doubtless have found favour with many, but in reality its full implementation would have been inhibited by the difficulties that would have arisen in connection with raising the necessary funds (low-interest loans, grants, etc), the promotion of the scheme, the engagement and training of the labour force, etc.

A first complex choice involved a total outlay of 150 000 million lire (fixed and operating capital of the units) and about 15 000 workers; further analysis produced final figures of around 80 000 million lire for investment and 8 000 for the labour force. The force of attraction of this essential nucleus (new working conditions, similar to those in large centres) and the incentives offered by legislation favouring the Mezzogiorno (hitherto offset by the disadvantage of most firms being vertically integrated) should progressively raise production and employment in the pole as new undertakings make their appearance.

If these objectives are borne in mind, and, in particular, it is remembered that the promotion of the 8 principal units planned is chiefly designed to stimulate the formation of 17 subsidiary units and 6 auxiliary units which are the indispensable "industrial services" for the sector, we shall avoid the error of underestimating the importance of these intermediate units, and judging them only according to their capital and payroll, which are fairly insignificant compared with those of the main units. The more so because, subject to minimum economic size, each type of subsidiary and auxiliary activity is wherever possible spread over two or three establishments, to allow greater flexibility in locating the new units and timing their establishment, and in order to ensure competition.

Finally, in evaluating the coefficients that can be deduced from the data for individual units (capital-intensity, labour-intensity, etc.) it is well to remember that we are dealing with a complex of integrated industries and not with individual enterprises, and that, since these industries have to operate at common-market and international level, the technical and economic criteria of maximum competitiveness have generally been given objective precedence over all others.

6.1.2. INVESTMENT

The total investment forecast for the units planned (see Table 6.1. - I) is 79 000 million lire at 1965 prices. Of this 63 %, or 50 000 million, is for the main units (which produce for final demand) nearly 34 % or 26 500 million lire for subcontracting units (units supplying rough products and finished parts, and/or manufactured articles needed for the production programmes of the other units)—and slightly more than 3 %, or 2 500 million lire, for the auxiliary units (doing work needed to keep the capacities of the other units operating efficiently).

Out of total investment, 86 % is for fixed capital (68 000 million lire) and 14 % (11 000 million lire) for operating capital. Of the fixed capital, 57 % is for machinery, equipment and general and special plant; 28 % is for buildings; 4 % is for workshop and office furniture and fittings, vehicles and other equip-

ment; 3 % is for preliminary costs (costs of formation, working plans, etc.); 6 % is for initial organization (costs of transferring workers brought in from outside and of training workers taken on locally), and less than 1.1 % is for land.

The composition of capital outlay varies according to the group or type of industry included in the complex. For the main units, operating capital is above the average figure (17.5 %), and preliminary costs and initial organization costs claim a more than average proportion of fixed capital (see the percentages in the table quoted). In the case of the subsidiary ([1]) and auxiliary units, plant, machinery and equipment account for 70 % of total fixed assets, as against 49 % for the main units.

The average capital invested per worker is 9.6 million lire overall; 8.5 million for the main units; 13.2 million for the sub-contracting units; and 8.2 million for the auxiliary units.

There are striking variations within the individual groups. Among the main units, capital per worker varies from 6.4 million lire for the unit making lift trucks to 12.1 million lire for the machine-tool unit. The variation among the sub-contracting units is still greater; from 6-9 million lire for workers in foundries, and metal-machining and galvanizing plant, the figure rises to 13-16 million lire for forges, heat-treatment plants and light pressing works, 17-22 million lire for the heavy and medium pressing works and gear-cutting plants, and to a maximum of 27 million lire for workers in the nut and bolt factory. The investment required for auxiliary units is 7 million lire per worker for units maintaining and servicing machinery and plant and 7-12 million lire, depending of the type, for those making tools.

The capital-product ratio, or the ratio between the value of the investment and added value ([2]) is 2.2 for all units: 2.0 for main units (1.6-2.1), 3.0 for subsidiary units (2.2-3.5), and 2.3 (2.0-2.9) for auxiliary units.

6.1.3. PRODUCTION

"Normal" annual output of the main units, expressed in physical terms should be about 115 000 metric tons of finished products (capital goods and consumer durables). They should produce 50 000 metric tons of heavy metal structures, 12 640 tons of cookers, bath tubs, sheet-metal radiators, and metal hollow-ware; 3 200 metric tons of centrifugal pumps and liquid fuel burners; 10 550 metric tons of farm machinery; 3 000 metric tons of machine tools; 18 150 metric tons of excavators, mechanical shovels, and crane lorries; 11 400 metric tons of cranes and mechanical conveyors, and 5 600 tons of lift trucks (see Table 6.1.-II). Of the tonnage produced by main units, more than 35 000 metric tons would be supplied by the subcontracting units.

At 1965 prices, the net turnover of the main units in normal operation should be 65 000 million lire (from 5 000 to 17 000 million lire from each concern). The product of the subsidiary units should be more than 16 000 million lire (the majority having turnovers from 200-400 million lire, but some foundries, forges, gear-cutting works, and one pressing plant reaching around 2 000 million lire (the last-named in fact having a turnover of 2.6 million lire). The auxiliary units would have a product worth 1 400 million lire. A large proportion of the earnings of the intermediate units would be obtained from purchases by the main units planned with the balance going to firms already in existence or now being established in the area (a minor proportion going to units outside).

Added value per unit as shown in the table already referred to represents the value of the product without duplication.

Value added by the entire complex should be 35 000 million lire, with the main units contributing 25 000 million (71 %), the subsidiary units 9 000 (26 %), and the auxiliary units slightly more than 1 000 million.

For the entire scheme the increment would represent 42 % of turnover. The percentage varies according to the different activities in the three groups. Added value would be 38 % of turnover for the main units, 54 % for the sub-contracting units (no assembly of parts supplied by others), and fully 78 % for the auxiliary units (mainly service operations and not processing).

6.1.4. EMPLOYMENT

The total estimated labour force for the whole project is 8 210, of whom 7 019 (85 %) will be operatives and 1 191 (15 %) office employees. About 72 % of the total will be employed by main units, 24 % by sub-contractors, and 4 % by auxiliary units (see Table 6.1.IIIe and, for qualified personnel, Tables 7.1 - I-II-III, and IV in Chapter 7).

On the average 3/4 of the labour force are directly engaged in production, and 1/4 are "indirectly" employed. "Direct" labour averages 77 % of the total in main units, 69 % in sub-contracting units and 82 % in auxiliary units. The percentages indirectly employed are 23 %, 31 %, and 18 % respectively. In the main and subsidiary units these proportions are governed by size; the former are substantial (large and medium-sized establishments) while the latter are smaller and need larger proportions of indirect labour

([1]) For ease of presentation, plants making nuts and bolts are included with subsidiary units, although according to the classification used in this report they belong to "other intermediary units".
([2]) Defined as the contribution to gross domestic product at the producer's selling price (excluding turnover tax).

to maintain internal services. In the auxiliary units, the low proportion of indirect labour is explained by the particular nature of their business (limited facilities for storage and movement of materials, hence less need for store-keepers, labourers, drivers, crane-operators, etc.)

As regards the degree of specialization, there are 1 201 skilled workers (1st category), forming 17 % of the labour force. Skilled workers account for 16 % of the labour force in the main and sub-contracting units, but exceed 55 % in the auxiliary units. In the main and sub-contracting units, they consist predominantly of workers whose connection with production is indirect (production-line-operators, inspectors, etc.), while in the auxiliary units most skilled labour is directly employed (machine-operators, mechanics, erectors, fitters, electricians, plumbers, etc.).

Semi-skilled workers (category 2) number 2 292 or 1/3 of the total labour force. They provide 33 % in the main units, 32 % in the subsidiary units, and 36 % in the auxiliary units. In the main and subsidiary units semi-skilled labour is divided between "direct" and "indirect" applications; and in the auxiliary units it is almost all directly employed.

Half the total number of operatives, or 3 526 persons, are in categories 3 and 4.

Office staff number 1 103, comprising 15 % of the labour force in the main units, 11 % in the sub-contracting units, and 9 % in the auxiliary units. The falling proportion of office staff reflects the differing composition and different planning, administrative, and commercial needs of these groups of units. All told there should be 136 works technicians (departmental heads, section heads, etc.) 307 works employees (employed in various service departments: methods, plant, materials, time studies, etc.), and 660 administrative staff, (estimating, planning, accounts, personnel and labour departments, sales, purchasing, etc.). 550 or about half of the total would be technicians.

Managerial staff (in many auxiliary and sub-contracting units the owner is owner-manager) number 88.

Table 6. I-III shows annual added value per worker. For all projects the figure is 4.3 million lire; but any differences between the three types of unit is basically attributable to the effect of capital-intensity rather than to the productivity of labour.

6.2. EFFECT OF THE OVERALL PLAN ON PROSPECTS FOR THE SECTOR

6.2.1. INTRODUCTION

The next part of this report analyses the project as a whole in relation to the prospective development of heavy and medium mechanical engineering in the pole when the new units have gone into normal production, which according to the provisional schedule should be in 1972 (see chapters 5 and 7).

It is impossible to analyse the complex in relation to all industry in the area and to manufacturing industries, in particular. This will only be possible when this study, which under its terms of reference is limited to the field of heavy and medium mechanical engineering, is extended to include the other main sectors of manufacturing industry. In particular, it will then cover sectors whose expansion depends not only on market potential and other factors but also on the creation within the actual sectors of essential intermediary units to be decided in due course; they include certain industries connected with chemicals and petrochemicals, textiles, and certain foodstuffs industries.

It is not enough to say that future large and medium mechanical engineering plants will need more supplies from other industries for the latter to emerge automatically.

One of the most outstanding results of this study is its clear demonstration that traditional criteria and methods (multipliers, input-output matrices,etc.) used in making plans for more advanced regions and countries, where they were originally worked out and used, cannot be applied to industrially backward regions. A condition for the validity of such criteria is that there must be a complete system of interrelated industries already at work; in poor countries and regions, the absence of such interrelations and the existence of a vicious circle preventing emergence of intermediary industries turn this methodology into an academic exercise pure and simple. Only by previous planning, promotion and establishment of nuclei consisting of integrated complexes of industrial projects for the various "driving" sectors can we apply these programming methods in such areas by creating the right conditions for them.

Assuming all "driving" sectors have been studied, it should be possible—with the help of further information about other industries, agriculture, and the service industries (already largely covered in part I of the report)—to evaluate the sector under discussion in relation to the entire economy of the pole (for economic projections the report would have to be extended to cover regional development plans).

Strictly speaking, no genuine quantatitive assessment can even be made of the way in which heavy and medium mechanical engineering is likely to be affected by implementation of the whole project. Even assuming marked expansion in this sector in Italy over the next 10 years, and in the flow of potential investment to the Mezzogiorno, the share going to the Bari-Taranto area would vary appreciably according to whether, over the period 1970-75, it was the only pole with a complete and efficient system of intermediary industries and specialist services for such a sector, or whether the programmes now being studied by the Minister of Finance and the Committee of the Ministers for the Mezzogiorno include plans for similar facilities for other poles (Naples - Salerno, etc.).

In the light of what we have said here it seems advisable, contrary to instructions given when this study was started, to confine the analysis of prospects for the pole to consideration of the prospects for heavy and medium mechanical engineering in 1972; estimated production and employment figures will be given for the units planned and for a "normal" expansion of existing industries in line with recent trends analysed in 2.1.2, including enterprises which are now being set up or are certain to be set up in the near future. The power of the pole to attract new mechanical engineering industries will gain full force when the new units have been created and the system is proving an economic success, that is, from 1972 onwards.

6.2.2. PROSPECTS FOR THE SECTOR IN 1972

In the projections which follow, heavy and medium mechanical engineering (considered separately from electrical engineering and precision mechanics) (1) does not include shipbuilding (structural problems) or the aircraft industry (there is only one plant in the area engaged in overhauling and repairing engines and making parts). 4 000 small engineering workshops in the area, employing 9 000 men (an average of 2 to 3 to each workshop) on general work (craftsmen, smiths) and repairs to motor cars, motor vehicles, consumer durables, etc. are also excluded. Only a small number of such works, of a certain size, have been taken into consideration as small units for maintaining plant, motor vehicles, and galvanizing plants (see further below). On the other hand, even small units which could in the strictest sense be thought of as craft undertakings have been taken into consideration where they produce goods included in the production of the sector.

The activities of the sector have been divided into two large groups; the main units (meaning those producing for ultimate consumption) and the intermediate units. Since the projections must be based on actual conditions—1963 in this case as the last year for which sufficiently complete data are available—it has to be decided whether or not certain existing enterprises should be included among the main, subsidiary, or auxiliary units. As already stated in 2.1.2., the pole has no true subsidiary units, which specialize in supplying rough products and finished parts for other industries. Instead there are a few medium-large vertically integrated firms which, apart from supplying their own internal needs, meet the demand of a limited clientele for castings, forgings, certain implements, etc. in this way keeping their plant and machinery fully occupied and making fuller use of some of their workers. In the final forecasts, an attempt is made in these cases to identify the part of output going to the intermediary units and the proportion produced for third parties is estimated.

Further, since there are some units in the area that work for other branches of industry on the maintenance and overhaul of plant, an attempt has been made to exclude all but those which work mainly for the sector under consideration. In accordance with this criterion, we have ignored certain relatively large units which almost exclusively serve the local iron and steel and petrochemical complexes.

The data for large and medium mechanical engineering in the pole cover the entire area, including Brindisi. The reason is that, while this urban-centre is mainly scheduled for the local development of industries in the petro-chemical sector, this does not *a priori* exclude a reinforcement of mechanical engineering activities, which are at present on a fairly modest scale since use could be made of the "industrial services" which would be located around Bari (or Bari-Taranto).

Turning now to the data: in 1963 heavy and medium mechanical engineering accounted for about 4 % of general industrial activity in the pole, in terms of both production and employment. Its contribution to manufacturing industry did not reach 6 %. Gross turnover (see Table 6. I-IV) was about 16 000 million lire, with added value of 7 000 million; workers in the sector numbered 5 300.

Of the totals quoted, 14 000 million lire of gross turnover, about 6 000 million of added value, and 4 700 workers, were accounted for by the main units. Structural engineering, mainly light, is one of the two relatively important activities in this branch. There is a limited output of lifting and transport equipment, and various machines for building and construction and for the extraction and processing of non-metallic minerals. There is a small output of sanitary equipment, household equipment and accessories, boiler-

(1) At the present time this type of industry is virtually non-existent in the pole. There are no large electrical engineering firms, except for one set up recently (about 200 workers), making refrigeration and air-conditioning equipment. A unit is projected for building transformers, alternators, thermo-alternators, and electric motors. The only industrial precision-engineering establishment in the area is a branch of Pignone Sud making control and regulation equipment, and instruments and automation equipment for industry.

work, and irrigation pumps. Almost no agricultural machinery is produced; power machinery is produced in small quantities, almost entirely for the foodstuffs industries.

In this sector, the manufacture of special equipment and the conversion of industrial motor vehicles are important. This branch of production, combined with structural engineering, contributes nearly half the value of the total production of the sector.

Finally, engineering workshops produce locks and small metalwork, metal boxes, and tools for arts and crafts, etc. However, the figures given in the table for this sector are mainly due to the recent opening of factories belonging to the Breda-ENI group which produce industrial valves and cocks and a variety of machines for the oil industry, etc.

In short, apart from a few medium-sized structural engineering firms, a large unit connected with industrial motor vehicles, and the two Breda-ENI enterprises referred to above, all output in this sector is based on small firms operating mainly in a regional context.

As to the intermediate units, operating within the limits described above, the value of the increment is about 1 000 million lire, and 640 workers are employed: the industries are, in order of importance, iron and steel foundries, forges, electro-plating units (1), and the maintenance and overhaul of plant, etc.

According to recent trends, analysed in 2.1.2., the output of industries now in existence, or projects now in hand, should rise by 4-9 % or more by 1972, depending on the branch of industry, and allowing for a further probable increase in productivity. On average, the annual increment should be 8 % for these industries and the number of workers should rise by 5 % per annum.

If we exclude existing industries in the intermediary class, which would tend to stagnate if not decline, with the creation of the specialist auxiliary and subsidiary units of the planned complex, and then consider only the main activities, the increases should be 9 % and nearly 6 % respectively.

It is to be noted that projects now in hand, which are included in this figure, relate to important new Breda-Insud enterprises in the fields of industrial boilers and vessels, and of diesel engines (2).

(1) These are exclusively small craft workshops.
(2) Other Breda enterprises still being studied have been included in the complex of the projects covered by this study; such are the production of motor cultivators and gears (the latter are included among planned subsidiary activities).

If we add the forecasts for the development of existing industries and projects in hand to the figures for the projected complex, we have the figures for the sector in 1972, shown in Table 6. I-IV.

The direct effect of implementing the whole project will be to treble the output of the sector, raising the annual growth rates to 24 % for value added and 14 % for employment.

The range of production in the main branches will widen considerably, and instead of depending predominantly on small units production will come to depend on large firms mainly using mass-production techniques and employing more advanced technology.

A modern integrated production system will take the place of the vertical structure that now characterizes the sector. It will be specialized in character and will link the main units to auxiliary and subsidiary units not previously in existence. Intermediate activities, which at present account for 15 % of the total figures for the sector, will account for 1/4 in 1972 and the quality of its contribution will be quite different.

It was noted in the introduction that it is difficult to assess objectively the indirect quantitative effects of the complex on the sector, since, to name only one reason, the power to attract new enterprises—although it will begin to be felt as soon as the planned enterprises come into being—will not be fully felt until the latest years covered by the forecasts. At all events, we may take it that about 1975, if the rate of development of the Italian economy—which has been recovering for some time past—is maintained at the same high level, there will be an influx of new main units, with consequent expansion of intermediate units and a rate of investment at least of the same order as that of the original complex; and by that time various units of the original nucleus could have started expanding.

If the development programme outlined in this report is put into effect, in ten years the heavy and medium mechanical engineering industry of the pole will play a fundamental and decisive part, alongside iron and steel and petrochemicals, in the manufacturing industries of the area and the whole Mezzogiorno.

The indirect effects of the pole on industries in other sectors will be felt most in construction and the manufacture of plant. The construction and erection of factories forming the complex, scheduled for 1967-68, will require all told 4.5 million man-hours for fabrication and various construction jobs, 3.3 million man-hours for installing plant of a general nature, and about the same number of man-hours for installing special plant; this is equivalent to a labour force of about 1 800 in 1967 and 2 600 in 1968.

CHAPTER 7

Conditions for carrying out the integrated set of projects and developing heavy and medium mechanical engineering in the pole

INTRODUCTION

This chapter briefly analyses the basic requirements for the success of a new, experimental policy for industrialization in the South, which is to be applied first to a "pole" in Apulia and could be extended from there to other poles in Southern Italy.

The survey does not cover the numerous aspects and methods of implementation, which come under the jurisdiction of public authorities [the Committee of Ministers for the South, the Ministry of Public Works, the Cassa per il Mezzogiorno (Southern Development Fund), etc.], who will in due course have to fit the necessary plans into their general programmes.

This study of the promotion of an industrial pole based on heavy and medium mechanical engineering does not seek to encroach on the field of regional programming (see Chapter 6); requests for public and private action are limited to what is necessary for promoting and carrying out all the projects and for developing the sector in the area, without any attempt to indicate needs shared with other sectors of industry, with agriculture, or with service industries. Moreover, these infrastructure requirements have already been dealt with in the planning schemes for the industrial development areas where the complex is to be created.

Contrary to what might be thought, the scale of the complex in terms of area occupied, labour force, consumption of water and energy, is relatively modest and considerably smaller than the scale of development and resulting infrastructure assumed in the planning schemes for the pole. However, this chapter will outline infrastructure requirements and other general or specific conditions for the promotion and creation of the complex and the development of the sector in the area. It will be left to the authorities named above to solve these problems. This question has already been appraised in sections 2.2, 2.3 and 2.4 of part I, where the actual and potential water resources and the technical, social, and cultural infrastructure of the pole are examined.

Furthermore it is not yet possible, in many respects, to go into details of requirements for the complete scheme; until the promotional work has been completed, it will not be definitely known what the composition and dimensions of the complex are to be or, what is more important, at least for the purpose of a detailed analysis of the infrastructure requirements, exactly where the units will be located within the pole.

Even though this report suggests that for economic reasons the complex should be concentrated around Bari, it is accepted that the main and intermediary units could be shared to some extent between Bari and Taranto ([1]). The Committee and the Cassa have not yet issued precise instructions about this. We also have to remember that, leaving aside persuasion and other factors (input-output relations with other units, differences in the cost of land, etc.), it is the individual firms which ultimately have to decide where their establishments are to be located.

It must be remembered that investments will generally go into industrial sites or estates set up beforehand by the Consortia (Consorzi). (Prices of sites suitable for factories throughout the Communes of Bari and Taranto will be as high as, and often higher than, in the Milan area; that is, they will be 4 000 lire per sq.m. or higher; prices will only be as low as 1 300 lire/sq.m. on the industrial estates, where the cost of providing services and utilities will be avoided).

When the site for the complex has been agreed on, it becomes essential not only to provide all the infrastructures required for the pole but also to time this work to fit in with the programme for the entire scheme. Although, for the reasons given, this programme cannot be finally worked out until the promotion phase has been completed, a provisional schedule can be suggested as a guide.

The provisional time-table for the scheme is therefore summarized below; it is intended to be carried out in a relatively short time, considering that the planning, construction, and erection of such a set of integrated units are dictated by those units which require the longest time.

1966 - promotion
1967 - planning
1968-1969 - construction and erection of the units
1970-1971 - starting up, and beginning of production
1972 - normal production

It is clear that if promotion took longer than a year the programme would inevitably fall behind schedule. The same would happen if for instance the competent bodies (consortia, etc.) were unable at the beginning of 1968 to provide their parts of the selected zones with all the services and utilities needed to start constructing the installations.

The concise and summary character of this programme and the general requirement that all the activities of the integrated units must start "simultaneously" should not be understood as an absolute requirement.

([1]) It is proposed to develop heavy and medium mechanical engineering on such axes that from the start they will be serviced by the intermediary units (auxiliary and subsidiary), even if the latter are located in only one of the two centres. But considering the radius of activity of these units, Brindisi, which is intended to be a centre of petro-chemical industries, would also be able to use their services for any mechanical engineering units which may be developed there.

This applies in principle to the main units (1). In view of programming requirements relating to the stocking-up and production of the integrated set of units, foundries and forges should start up at least 6 months before the main units, while subsidiary units such as the metal-working and machining works, including the gear-cutting plants, should start up 3 months before. Subsidiary processing units and the nut and bolt works (2) should be advanced by the same time.

The auxiliary units (maintenance and tool-making) should, on the other hand, start up simultaneously with the main units in spite of the fact that it is intended that they shall work at a much reduced rate for the first two or three years, when their own workers will be completing their training (3). Also, where the auxiliary units are of a type for which more than one plant is planned, one will be established at the start, and others will follow later, to match the demand of the complex.

The times laid down in the following chapters for completion of the infrastructure and other measures relating to the creation of the complex, are based on the provisional schedule set out above.

7.1. INFRASTRUCTURE NEEDS

7.1.1. GENERAL EDUCATION AND INDUSTRIAL TRAINING

By the beginning of 1970, the new factories included in the set of integrated projects which will form the nucleus for future development of heavy and medium mechanical engineering in the pole will have to find 7 000 more workers (see Table 7.1.1.), of whom more than 1 200 will be skilled (category 1) about 2 300 will be semi-skilled (category 2), and 1 100 staff employees, at least 550 of whom will be technicians (see 6.1.4.).

These requirements will be additional to the "normal" annual needs of industries belonging to the sector, which are modest, if we take into account the need to replace staff and the rates of expansion forecast (see 6.2.2.).

One cannot predict with certainty that in the three years between the definitive decision to create the integrated set of units (the promotion phase will be completed at the end of 1966) and the date when the units go into service (1970) there will be appreciable improvements in the "natural" supply of skilled workers and technicians on the local labour market; indeed the present scarcity may become definitely worse.

In the light of the factors considered and the forecasts worked out in 1.3., it is thought that, even considering the labour market for the whole "Major Region" and the possibility that workers now employed in the north or abroad will return, the units included in the project will be unable to attract more than some 100 to 200 local skilled workers and 400 semi-skilled, which is less than 15 % of total requirements and comprises men who will in general be less well trained than those in the north. As to higher-grade technical and administrative personnel with the necessary experience for immediate employment at the units under study, a realistic assessment must be that the market potential is insufficient.

The educational system as at present constituted does not provide training for skilled and semi-skilled workers but gives only general instruction. The schools cannot therefore be expected to make any notable contribution. On the other hand they will be able to help considerably in providing the necessary technical and administrative assistants and ordinary office staff.

Leaving on one side for the present the need to import technical and administrative staff, the basic problem is that of skilled and semi-skilled labour. This problem, which has been under examination from the start, has led to the formulation of general criteria of selection and is one of the factors which has determined the aim of keeping the integrated set of units as small as possible.

In these conditions, solutions have also had to be sought outside the firms. One of these has been the organization of vocational training courses for workers in the area, by public and private bodies and by the recently created inter-company centres.

We saw in 1.3.2. that despite efforts to improve the quality of such courses they are still proving unsatis-

(1) The unit making heavy metal structures could start work a year or more in advance, in order to supply sheds and other products for use in the construction of the other units. However, as it takes about two years to construct and erect such a unit (it is among those that take the longest time) such an advance would be difficult to achieve.

(2) The nut and bolt unit could in fact come into operation one year in advance, using its limited initial output to meet the demand arising from the construction of the other units.

(3) For the tool-making workshops, however, there is considerable potential demand for new equipment in Southern and North Central Italy. While the demand for repairs to new tools comes mainly from units operating within a limited range, the demand for the construction of equipment (initial fitting out of factories and subsequent replacements) is normally met by national or even international tender.

factory. It would be asking too much of the competent bodies to expect them in the space of a year or two to solve problems that have proved intractable for a long time (aptitude tests for the selection of trainees, inadequate instruction, out-of-date methods, etc.) and almost immediately to produce thousands of qualified workers. Possibilities for using the inter-company centres at Bari and Taranto are in practice very limited, first because the number of qualified mechanics trained each year is very small (hardly sufficient for the needs of existing industry) and secondly because these centres are mainly intended to serve the IRI (1) industries in the area. A further load on the Centres' limited potential is the exceptional nature of the demand from the planned units which is concentrated almost entirely in a single year (1970).

In looking for skilled and semi-skilled workers, the units forming the complex will therefore have to rely on local unskilled labour to be trained by suitable courses at the expense of the firms themselves in the year before they come into operation (1969).

As was said in the chapters on the general aspects of the projects (5.1.) and in those dealing with the projects themselves, it is the intention that the main units shall "import" only essential workers from the north, amounting to about 10 % of the total number of skilled and semi-skilled workers required; further training courses, lasting about two months, will be provided at the parent firms in the North (or abroad) for the small number of skilled workers available locally, to confirm their suitability for engagement and bring them up to date on the equipment and processes used in the unit. All other Grade 1 and 2 workers (the remaining 70 %) will be taken on without any qualification and sent to the same factories in the North (or abroad) for training courses lasting 3, 6, 9 and 12 months, depending on the future duties. They will complete their training at the factories in the pole, during the first two years of operation, after which they will become tradesmen (see Table 7. I-II). This solution will determine the rate of production of each individual unit during its first years of operation.

Locally-engaged technical and administrative staff for employment in Grades 1 and 2 will also attend training courses in the North lasting 3, 6 and 9 months.

As pointed out in 6.1., most of the intermediary units are medium-sized or small and would find it difficult to arrange training courses in the North because they require only a limited number of skilled workers. It is therefore planned to import up to 50 % of the labour force and to engage the remainder (workers for jobs in Grades 1 and 2) locally. They will be unskilled and will train on the job during the first two years of operation under the guidance of the imported specialists. Because of their special needs, some subsidiary units (foundries and forges) will, as an exception, adopt the solution recommended for the main units (see Table 7. I-III and IV).

To sum up, in addition to the import of nearly 1 000 workers (including about 90 managerial staff), further training courses will be organized for more than 400 workers and initial training courses for a further 2 300, both outside the pole (see Table 7. 1-I).

The means chosen to provide skilled and semi-skilled labour and senior technical and administrative staff for the units of the complex will undoubtedly be very expensive for the firms which will carry out the projects (cost of training courses and cost of importing trained workers).

These costs will range from 5 % to 17 % of the total capital outlay (net of contributions by the Cassa) for the main units. The training of workers will alone account for 3 % to 12 % of investment costs merely for travel and subsistence allowances. Ignoring the direct cost of the courses, this expenditure is, therefore, a genuine additional charge which equivalent firms setting up in the industrial triangle do not have to bear.

It is therefore suggested that as a special incentive for the development of the pole, the Cassa should refund to firms part of the cost of sending each worker to initial and further training courses at factories in the North. The refund would be at least at the same rate as the public authorities are believed to have spent per head to promote the existing occupational training courses with their notoriously poor results. This special contribution could be made in respect of courses concluded in the first year of operation of the factories (1970).

With a view to the further development of the sector, and of industry in general in the area, the educational authorities should be urged to continue the efforts they are already making to extend compulsory schooling and to raise the quality of instruction in the middle and higher technical grades of existing establishments. It should be remembered that in the area of the pole, as elsewhere throughout Italy, the training of skilled and semi-skilled labour will in future continue to be the responsibility of the firms concerned, and that this activity will tend to increase in importance; it will rest with the State to provide and improve general education. This allocation of responsibility can be justified on objective grounds by the fact that technological progress is more rapid than the complex and laborious adaptation of the school system to modern developments because schools lack flexibility when faced with the changing specific requirements of the various industrial sectors.

In the northern Italian triangle, workers have long been trained by their employers outside the educational system. The bigger engineering units meet their

(1) Istituto per la Ricostruzione Industriale (Institute for Industrial Reconstruction).

basic requirements by training replacements and additions to their pool of skilled workers in their own permanent schools, attended by young people who have finished their compulsory education (at the age of 14). They are given technical and practical training and qualify as semi-skilled workers (Grade 2). After completing their military service, and gaining experience on the job for two or three years, they obtain skilled workers' qualifications (Grade 1) on the basis of practical tests (capolavoro). Foremen are selected from among these workers according to experience and merit via successive internal promotions; those who specialize on the workshop side may eventually become overseers. In medium-sized units with a certain amount of prestige these permanent courses, though organized on a more modest scale, are the general practice. In small firms, training is a slower process by way of apprenticeship and on-the-job experience.

This system of permanent company schools provides employers with skilled and semi-skilled workers trained to their own standards, whereas the official school system gives only general instruction even in schools for occupational training.

Once set up in the complex, the firms operating the main units will have to choose between two ways of satisfying their later requirements for skilled and semi-skilled workers (as replacements or to expand activities); either they can set up their own "apprentice" schools or they can rely on the inter-company centre in Bari (or possibly) Taranto, enlarged and improved to provide training for posts meeting the employers' specific needs. In this case the competent authorities (Ministry of Labour, Cassa per il Mezzogiorno, etc.) would need to reinforce the training centre considerably around 1971. In general, the medium-sized units and particularly small firms in the complex would in any case be well-advised to use these centres (1).

To sum up, establishment of the complex calls for the following action in relation to vocational training and general education:

1. Recognition that the situation facing companies who operate the units in the complex is exceptional in that it involves training local labour; the Cassa per il Mezzogiorno should make a special contribution for each worker sent to an initial or further training course in the North of Italy or abroad;

2. Once the complex has been set up, the competent authorities should, at the request of the large units, expand the inter-company vocational training centre at Bari (and possibly Taranto) and increase the number of courses for workshop employees;

3. Continuation of current efforts to extends compulsory education and improve the quality of the instruction given in middle and higher technical institutes in the area of the pole.

(1) The costs of running the Inter-Company centres will be met by the Ministry of Labour, the Cassa and the associated firms.

7.1.2. TRANSPORT AND COMMUNICATIONS

The transport system in the area is in general satisfactory, (it is analysed in detail in 2.3.3.); taking into account the various improvement programmes under way, the creation of the complex and the development of the sector do not in principle impose any major new conditions or requirements.

Nevertheless it is to be recommended that the various works programmes should be completed on time, or, if possible, before time.

The same applies to the communications system, the more so as in the current situation its adequacy depends on programmes and projects now in progress (see 2.3.2.).

In regard to transport and communications, special stress should again be laid on a number of points that are essential to the industrial development of the pole, which needs rapid and efficient transport and communications linking its cities and their industrial areas with the Naples pole, with which it will have growing industrial relations, and the main markets of Italy and the European Economic Community.

Specifically, it will be advisable to speed up work, complete the following projects, and study the following programmes:

1. The Naples-Bari motor-way, of which the Naples-Avellino and Canosa-Bari stretches are at present under construction while the intermediate section between Avellino and Canosa is being put out to contract. Its completion will link traffic from and through the pole with the autostrada del Sole (North-South motorway).

2. While the Naples-Reggio-Calabria motorway is not directly connected with the "Apulian pole" it would be well to sound out the competent authorities about a spur running along the foot of the mountains from near Taranto, to join the motorway at Spezzano Albanese, thus ensuring rapid communications between the pole and Sicily.

3. Certain roads within the "pole" itself need modernizing in various ways (removal of level crossings, by-passing of built-up areas, etc.), so that they can be classified as roads suitable for "fast traffic". These are:

— SS 100 (E58) from Bari to Taranto;

— the Appian way, SS 7, connecting Taranto and Brindisi. An alternative to this route is needed between Taranto and Grottaglie;

— the Monopoli-Brindisi section of the coast road between Bari and Brindisi, SS 16 (E2). The remainder of this road (Bari-Monopoli) has been modernized,

but is not classified as suitable for fast traffic. It would be advisable to revise the route (1).

4. The Basenta road, the rapid completion of which could also benefit Taranto, and hence the area of the pole.

5. When zones are selected to be equipped for the establishment of industries in the pole, timely provision will have to be made for the modernization of a series of roads (provincial, local, farm roads, etc) used to bring workers from scattered centres of population.

6. Improvement of the permanent way, stations, rolling stock, possible doubling and electrification, of the State railways connecting the cities forming the centre of the pole.

7. Port works, particularly the extension and improvement of the installations by the co-ordinated efforts of the harbour authorities of Bari, Taranto and Brindisi.

8. Extension of telex and telephone services, and of trunk dialling between the main towns in the pole and the principal cities in other parts of Italy.

7.1.3. WATER, ELECTRICITY, NATURAL GAS

Table 7.1 - V shows the total annual requirements of units forming the complex for industrial and drinking water, electric power for industrial use and lighting, and for natural gas. These figures are for consumption under normal conditions (2); increases in consumption after the future extensions have taken effect are forecast in a general way.

Total requirements of industrial water (2) are 1.5 million cu.m./year (about 50 litres a second), of which 481 000 cu.m./year will be taken by the main units, more than 1 million cu.m./year by the subsidiary units (3), (mainly for heat-treatment, metal-working, forges, foundries, and electro-plating works) and 10 000 cu.m./year for the auxiliary units. Allowing for future development of the integrated units a total supply of the order of 2.2. million cu.m./year, or about 70 litres/second will be needed. All the units of the complex whose consumption is more than 8 000 cu.m./year will have their own recirculating plants; the resultant saving in water will average 1/3.

The total demand for drinking water is 12 000 cu.m./year, of which 8 000 cu.m./year is for the main units, 3 000 cu.m./year for the subsidiary units, and less than 1 000 cu.m./year for the auxiliary units. Allowing for the extension of these units, the total rises to 18 000 cu.m./year.

Normal consumption of electricity by the units of the complex is 109 million kWh/year, of which 26 million kWh is consumed by the main units, 81 million kWh by the subsidiary units, owing to the large demand of the foundries and forges, and metal-working and heat-treatment units, and 2 million kWh by the auxiliary units; allowing for extensions the total demand will be 156 million kWh. The annual consumption of electricity for lighting is about 5 million kWh, rising to 6 million kWh after the extensions.

Requirements of natural gas for the complex arise wholly from certain subsidiary units (foundries, forges, heat-treatment units, gear-cutting plants (4). The total is more than 9 million cu.m./year, which will increase to 13 million cu.m./year with the extensions.

Of these 9 million cu.m./year, 3 million would be used in winter to heat the units supplying finished components and carrying out treatment processes; oil heating would have required an additional installation, whereas the existing one can be used for production (heat-treatment) and for feeding the furnaces (foundries and forges).

According to the provisional programme, the above quantities of water, electric power and natural gas should in principle be available before the middle of 1969, or at least 6 months before the integrated set of units starts to operate (plant tests, etc.). However, the quantities for the subsidiary units, which have to start production 3 - 6 months in advance, must be available without fail at the start of that year. It has also to be remembered that a certain amount of water and electric power will already be needed from 1968 onwards for the construction of factories.

In this report the suggestion is made that the integrated set of units be located in the industrial zone of the Bari Consortium, or, as a second choice, that it be shared between the Bari and Taranto zones. Judging from the thorough examination of the problem that was made in 2.2.2., 2.3.3., 2.3.4. and 2.3.5., there should be no difficulty about supplying electric power at the required times, particularly at Bari. In addition, the Bari industrial area is the only one in the pole with a natural-gas pipeline (at Taranto the forges can burn gas-oil, even though it is less economical).

Nor should the supply of industrial and drinking water present any problems, at either Bari or Taranto; total requirements are modest, due to the relatively small size of the complex and above all to the principles followed in planning with a view to economizing with water (recirculating plants, apparatus and devices for limiting consumption). Currently available local supplies can be used (see 2.3.4.).

Allowing for "normal" expansion of existing industries engaged in heavy and medium mechanical

(1) Conversion of the SS 96 from Bari to Matera into a road for fast traffic is also worth considering.
(2) In the text, the term "consumption" is taken as equivalent to "requirements".
(3) Including the nut and bolt factory.
(4) The gear-cutting plants need natural gas because they perform their own heat-treatments.

engineering in the pole, and assuming that the units of the proposed complex may themselves already have expanded by 1975 when cumulative effects may also have caused the addition of new mechanical engineering establishments with a rate of production equal to that of the original complex, the demand for water would, it seems, be something like 150 litres per second higher than the present consumption of the whole sector. This is still within the available supply, provided of course that rational use is made of this water, at least by the new industries.

If we take into account the whole range of all sectors of industry, and not just heavy and medium mechanical engineering, and particularly if we assume that certain activities will expand rapidly (iron and steel, petrochemicals, industries in the petro-chemical sector), it is clear that requirements of industrial water will increase progressively after 1975 until they approach the quantity specified in the planning schemes for the industrial areas. The major schemes— and in due course, the technicians— provided for in those programmes will then become necessary.

The data concerning demand for industrial water are somewhat overestimated. For the main units, and in general for units engaged exclusively on mechanical engineering, the figures obtained during a special *ad hoc* enquiry which consisted in taking direct measurements at similar works in the North, have been increased by 50 %. Special enquiries were also made for foundries, forges, treatment processes; it was not thought that the figures for these units should be increased to the same extent. The fact remains that the result of this present study throws some doubt on the demand forecasts for industrial areas and nuclei in the South which were used in the preparatory work leading up to this report.

In spite of the reassuring figures, it would be advisable, before deciding to start work on developing the pole and before choosing its location, to join with the Cassa del Mezzogiorno, the irrigation authorities of Apulia and Lucania, etc., in checking the water resources that are available and immediately usable for starting up of the units of the complex. A plan of action should then be worked out in conjunction with the Cassa.

The same applies to electric power and natural gas and ENEL and ENI should revise their programmes accordingly.

Summary:

1) By 1969, the creation of the complex will require an assured annual supply of 1.5 million cu.m. (50 litres/second) of industrial water, 12 000 cu.m. of drinking water, about 110 million kWh of industrial electric power, 5 million kWh of electric power for lighting, and 9 million cu.m. of natural gas. By 1975, extension of the complex alone might require an increase of 40-50 % above these figures;

2) The competent authorities should draw up a plan of immediate action to provide the water, etc. required by the complex;

3) For the general development of industry in the area, it is essential that infrastructure projects for these utilities incorporated in the planning schemes should be completed by 1975.

7.1.4. INDUSTRIAL ESTATES

The analysis in 2.3.5. showed that the industrial estates in the Bari development area would in principle be the most logical and economical location for the proposed units of the project. As Table 7. I-V shows, the units of the complex require 110 hectares net (including space for expansion) (1), comprising 79 hectares for the main units (with areas varying from 30 000 sq.m. to 218 000 sq.m.), 30 hectares for the subsidiary units (varying from 3 000 sq.m. to 60 000 sq.m.), and 1 hectare for the auxiliary units. If the complex were shared between Bari and Taranto (see 4.2.7.), there would be 75 hectares net in the Bari development area and 35 hectares at Taranto.

In the Bari industrial estate there are a further 100 hectares which have not yet been allocated: this area could accommodate the entire complex (an additional large extension is now being requisitioned). This is the first industrial zone created in the South and the most advanced; a large part of its sites already have roads and other services. However, in order to house the complex adequately the Consortium should complete the entire extension to be occupied by the units. In due course it will be necessary to provide the various road (2) and rail systems inside the area, mains to carry industrial and drinking water, power lines, etc. without which it will be impossible to start constructing the new establishments.

All this work on the estate should be completed within not more than a year. In fact, as soon as the promotion period is over (at the end of 1966) the Consortium should have plans of the sites for the individual establishments of which the integrated system will finally consist. (3). On this basis, and with the support of other necessary data, the Consortium, aware of the needs of the new industries and the composition and allocation of the sites (blocks and lots), will have to work out the executive details of the programmes and get the work going, completing it in the course of 1967. Only in this way can the industries of the integrated system start production in

(1) An average of 74 persons employed per hectare.
(2) A temporary road-bed to ensure transport will be sufficient.
(3) It will not be necessary to await executive details in order to know what area (including that for the extensions) is to be occupied. It will in general be enough for the purpose to undertake a rapid revision of the feasibility projects, etc.

1970. In other words, the Consortium must enable undertakings to start construction at the beginning of 1968. This means that it must have arranged for road and rail connections, power, industrial water, telephones, etc. for the individual lots which have been occupied.

By 1969-70 all work under the planning scheme for connecting the estate to the general infrastructures of the area, with particular reference to the general (see 6.1.2.) and urban transport system must also have been completed. This applies to the Taranto complex and to any other suitable industrial zone that is finally selected.

So that the necessary equipment can be provided quickly in the estates to be prepared in the selected localities the Committee must act in conjunction with the Consortia concerned and with the Cassa del Mezzogiorno. Against this background it will be necessary to enumerate at detailed town-planning level all the specific infrastructures to be included in the general programmes.

To sum up, the establishment of the complex requires:

a) Preparation of the selected industrial sites before the end of 1968, so that all necessary utilities can be connected to the factories, over a total net area of 110 hectares;

b) Completion, by 1970, of all major projects included in the planning scheme for the estate selected for the complex, on which its proper integration into the general system of infrastructures depends.

7.1.5. RESEARCH CENTRE

Unfortunately, there is no place in the pole in the immediate future for the important part played in some industrial complexes by special University Institutes working with the research units of large firms.

It would however be advisable that the University of Bari consider the demand for engineers that will be created by the industrial development of the area in the coming 10-15 years, and that, against the background of national requirements, the competent authorities give thought to the creation within the engineering faculty (which at present covers only civil engineering) of an industrial section concerned specially with mechanical and chemical engineering and offering post-graduate courses for further specialization, with a highly qualified staff and the most up-to-date facilities.

In the immediate future, the Breda Research Institute recently established at Bari should be expanded and equipped to carry out tests, analyses, studies, and experiments and to give advice to Italian industries and guide them in matters that more particularly concern heavy and medium mechanical engineering; its contacts with other institutes in Italy, the Community and elsewhere should also be extended. There is no doubt that the large units of the integrated system will be extremely interested in the prospect of having at hand such an indispensable service which would enable better use to be made of their own study units and research on problems of common interest to be co-ordinated.

Thus, the establishment of the complex, the expansion of the sector and in general the industrial development of the area, require:

a) expansion and equipment of the Breda Research Institute at Bari to meet the new and growing needs;

b) creation of a Department of chemical and mechanical engineering in the Faculty of Engineering at the University of Bari.

7.1.6. HOUSING AND OTHER ENVIRONMENTAL FACTORS

A pre-requisite for the creation of the integrated set of units, the further development of heavy and medium mechanical engineering and of industry in general in the pole is the extension and improvement of the social infrastructure of the area (schools for general instruction, hospitals, tourist facilities, etc.).

It is generally accepted that in order to attract and hold employers, executives and highly-skilled workers in recently industrialized centres adequate social facilities must be provided as well as economic incentives.

Although the determination of the overall needs of such infrastructures is a matter for regional planning, it is part of the purpose of this study to advise the competent authorities to include in their programme those essential items that will contribute to the establishment of the complex.

In the first place, having regard to the housing problems of Bari and Taranto (see 2.4.1.), it will be necessary by the first half of 1969 to provide 7 000 dwellings for workers and 1 100 dwellings for staff employees in zones selected to adequate town-planning standards and in accordance with the planning schemes (relative proximity to the industrial estate or estates in which the units of the complex are situated, etc.). These residential areas need to be equipped with the essential services: schools, shopping centres, city transport, etc. (see 2.4.3. and 2.3.1. on the subject of the unsatisfactory nature of school facilities in the area of city and inter-city transport).

This accommodation for workers and employees must be reserved for those working in the units of the complex and as such must be included in subsidized housing schemes. The authorities should, as far as lies in their power, give support to firms which propose to build residences for their senior staffs.

In regard to medical assistance for the workers (operatives and employees) under the INAM programmes,

it should be remembered that the establishment of the complex will create a highly concentrated demand for medical services, involving about 28 000 persons, including family members entitled to benefit.

Recreational facilities constitute an important social aspect which employers will do well to consider in the promotion phase, as a means of retaining in the area the skilled labour trained at such cost, and the essential executive staff brought in from outside.

Admittedly, it is not possible to modify an entire environment which has been conditioned by social and cultural characteristics, nor may one look for the *ad hoc* creation of a tourist "pole" in the neighbourhood (these are general problems outside the scope of this study), but it is quite possible to set up a social centre for the use of all units in the complex, which, like the great firms in the North, will offer workers and employees: a library, lectures, theatre shows, concerts, various kinds of entertainment, sporting facilities and a swimming pool. The inter-company recreation centre could also have its own bathing place with facilities for aquatic sports at some nearby point on the coast. The firms forming the complex would have to take the lead in creating the centre (they could be asked to give an undertaking in principle at the time of negotiating their participation in the creation of the pole), by the competent authorities should offer special financial facilities (sites, grants, etc).

To sum up, the social facilities required in connection with the creation of the integrated set of units are:

a) The provision by the authorities, by 1969, of more than 8 000 dwellings for workers and employees in the complex, to be built in areas with convenient access to the new factories and equipped with all the necessary services;

b) The early organization of medical services for workers by the Istituto Nazionale Assicurazione Malattie, for a total of 28 000 patients;

c) The creation of an inter-company recreation centre for the new industrial environment that will come into being in the area—with grants and other forms of support.

7.2. PROMOTIONAL NEEDS

7.2.1. GENERAL ASPECTS

The essential purpose of the operation as a new instrument for the industrialization of Southern Italy is—as has repeatedly been emphasized—to provide heavy and medium mechanical engineering with at least one of all the auxiliary, subsidiary, and other essential intermediary units which are at present found only in large concentrations of industry. Once these intermediary industries have been created over a radius of about 30-40 km in the area concerned, together with first-class communications up to a distance of 100 km (virtually the entire Bari-Taranto-Brindisi triangle), it will be possible to set up nearly all the main heavy and medium mechanical engineering industries which at present are so rarely found in Southern Italy for the want of these intermediary industries, which no incentives, however great, can make good.

The creation of these auxiliary and subsidiary units will introduce a completely new element when operators prepared to consider investing in the mechanical engineering industry in the South are assessing the advantages of the pole. It will then be possible to attract to this area a great flood of new enterprises such as it would be hard to introduce into the South other things being equal.

Because these essential intermediary units cannot develop unless there is sufficient local demand, a small number of large client industries (8 main units) have been picked out for simultaneous development in order to break this vicious circle. These main units are capable of absorbing the output of the intermediary units (23 auxiliary and subsidiary units, including one nut and bolt works). The subsequent creation of further main units will, in the new conditions prevailing in the area, be left to the free interplay of market forces; the same applies to the other auxiliary, subsidiary and intermediary units which will reinforce the output of the original ones as and when the development of the pole increases the number, and consequently the demand, of the main units that come to be located in the area. The object of the scheme for the pole, and hence of the promotional effort, is the implementation of the integrated set of projects for the main units and the essential intermediate units. However, this does not mean that during the promotional period additional main units may not be included in the project at the request of would-be investors. We will return to this later. It has been repeatedly emphasized that as far as concerns the main units the operating plan for the pole is not a rigid one. New enterprises in the field of heavy and medium mechanical engineering can be incorporated; some of these projects for the main units selected by the study could be modified to a certain extent; if need be, projects could be replaced by others—suited to firms' special lines of business—always provided that they result in about the same level of inputs from essential intermediate units.

As far as concerns the main units, promotion consists in establishing contact with undertakings in Italy, the Community and elsewhere, which would be interested in investing in Southern Italy, and making proposals to them to that end, demonstrating to them the economic advantages of the enterprise. In this respect, one could point to the new investment opportunities about to emerge in an area of the South, where undoubted resources (human, natural, etc.), and substantial incentives (tax concessions, credits, etc.) are now supplemented by the advantage of operating in an environment where conditions are the same as in the great concentrations of the north, not only as regards the infrastructure but also as regards relations between industries.

In the case of industrialists who may be willing to invest in the intermediary units, promotion would mainly be concerned with demonstrating that the needs of the main units for supplies will guarantee them a safe, adequate, and appropriate market.

When the promotional approaches for main and intermediary units are compared, it looks at first sight as if we are confronted with yet another "vicious circle"; in reality, promotion can follow both lines simultaneously, and the operation can be treated as a concerted whole.

In particular, at the promotion stage, the advantages of investing should be demonstrated by allowing firms to scrutinize the structure of the whole set of projects (as summarized in Chapter 4), and the study of the commercial, technical, and economic feasibility of the proposed units (see Chapter 5).

The feasibility studies for the main units were made by experts and technicians who are well known in the field; they contain, among many other items, a detailed comparative study of investment and operating costs as between units set up in the pole and similar units established in Italy's industrial triangle (the Milan area). These feasibility studies show that, under the operating conditions described and considering the incentives, production costs in the area of the pole are equal to or lower than those in the industrial triangle and that profits net of tax are considerably higher. The feasibility studies for the intermediary units likewise indicate substantial profits.

The promotion of the pole is certainly a complex operation, but can be brought to fulfilment if the personnel, means, and directives are of the right kind, since these projects are economically sound and the integrated set of units is not on too large a scale.

7.2.2. ORGANIZATION OF PROMOTION

A first essential for the success of the operation is the right choice of a body to act as promoter and assume direct executive responsability under the Committee of Ministers for the South. This could be the IASM; or a suitable *ad hoc* body might be constituted. There should be a small co-ordinating committee representing the Italian and Community organizations taking part in the scheme (Cassa per il Mezzogiorno, EEC Commission, European Investment Bank, Isveimer, etc.).

The promoting organization would be guided by precise directives. In view of the size and nature of the proposed main units, and indeed of some intermediary units, the promoters should be instructed to contact only firms in the branch which are already operating at international level and in principle willing to share in joint ventures. The aim here is to ensure maximum technological, economic, and commercial efficiency for the proposed units and to give the complex a character that is not merely Italian but bears the stamp of the Community and is open to the rest of the world. The directives should give some priority to private enterprise, leaving to the State finance companies (IRI, BREDA, INSUD, etc.) the extremely useful task of filling any gaps in the integrated system (both main and intermediary units), thereby making it possible to start on time the work of establishing the complex.

From the above brief statement it will be apparent that promotion is not merely a matter of getting in touch with businessmen to explain the nature of the whole operation and to suggest individual projects in which they might be interested. It also has to be conducted at a technical level to provide all the additional detailed information needed concerning the scope and content of the projects in order to confirm that the plans themselves are sound in every way and in order to weigh the effect that any variants which firms may wish to introduce will have on the integrated set of units.

Finally, when the promotion stage is completed and the numbers, sizes and outputs, of the units forming the complex are known for certain, it will be necessary to check, and possibly to rescale, the essential intermediate units.

At this stage, when the composition of the units of the integrated system and their locations are known, it will become urgently necessary not only to revise and delve more deeply into the general infrastructure requirements but also to draw up the definitive programme for construction and erection and thus for the entry into service of the units (see Chapter 5 for the various dates for the construction and erection of the units and the dates for the entry into service of the various intermediaries). The Consortium must also be given the plan showing the areas occupied by the units of the integrated system so that it can at once provide the industrial sites with the necessary connections for the various utilities without which it will be impossible to start construction.

Throughout this stage, the promoting body thus needs continuous and effective technical assistance, to be

supplied by the consultants who worked out the integrated set of projects. Once construction and erection have started, the promoting body will in principle no longer need such assistance. The Consortium will already have proceeded directly to the executive planning of the lay-out of the lots. An *ad hoc* Committee with members drawn from the units concerned (1) will deal with the technical and economic problems that arise after the complex starts production—particularly during the first two years—with regard to the co-ordination of demand for essential inputs by the principal units so that the intermediary units can programme their production adequately.

In addition to the cost of technical assistance, the promoting body would have to bear other direct costs for staff, travel, etc. It must therefore be supplied with the funds needed to meet its financial obligations. The total cost of this entire stage of promotion should not exceed 0.5 % of the planned investment.

However, the operation cannot rely for its success on adequate direction, staff, and means; these are necessary but not sufficient conditions.

The main requirement is that the promoting body should be in a position to assure interested firms categorically that if they accept certain obligations, they will in return receive firm guarantees. Having reached their decisions of their own free will, in line with their particular policy, firms will be bound by conditions regarding location, size, pattern of production and times for the construction and erection of their plant, once the projects (with any modifications) have been incorporated in the final scheme for the complex.

(1) In order to work out their internal programmes, the subsidiary units need to know 3-4 months beforehand what supplies the principal units need. This programming is somewhat difficult during the starting up of the project, when the level of inputs to the client units varies continuously. As the production of the client units becomes organized, programming becomes easier. However, at "peak" outputs it is possible to cope by operating a third shift, etc.

If they are to take such a decision, it is only fair that they should have the assurance that the integrated set of industries will indeed be set up (State finance, etc.), that the stipulated incentives and loans will be granted in full and punctually, and that all the infrastructure services planned for the area will become available in full and at the specified times.

These assurances will have the desired effect if the Italian Government (Committee of Ministers, Cassa per il Mezzogiorno, etc.) and the European Economic Community (EIB) make public, formal, and precise declarations of intent about those parts of the project within their jurisdiction, and if these are followed by the appropriate infrastructure programmes and the granting or allocation of funds, etc. Table 7.1.VI shows the distribution of loans at reduced rates of interest and the grants to be made to the various units of the complex.

To conclude, the basic requirements and conditions for the promotion stage are :

a) the appointment of a special body answerable to the Committee of Ministers for the South, to be responsible for the work of promotion, and the setting up of a special co-ordinating committee drawn from the various Italian and Community organizations taking part in the scheme.

b) the issue of precise directives to the promoting body concerning the businessmen to be approached and other essential matters, etc.

c) provision of staff and funds to enable the promoting body to meet all the costs of such an operation (personnel, travel, technical assistance).

d) the promoting body must be in a position to guarantee to interested businessmen—who will enter into commitments regarding the size of their establishments, their pattern of production, and construction and erection schedules—that the integrated set of units and the proposed infrastructures will be completed, and that the promised loans and incentives will be granted at the times and in the manner specified.

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