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Economies of Scale and the Integration of the European Economy the Case of Italy

by Rodolfo Helg and Pippo Ranci *

Internal paper

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The Directorate-General for Economic and Financial Affairs,
Commission of the European Communities,
200, rue de la Loi
1049 Brussels, Belgium

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* Istituto per la Ricerca Sociale

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I. The extent of sub-optimal capacity at the plant level

1. Introduction

There are three main possible sources of economic gain arising from the adoption of the Internal Market Programme: increased specialization in accordance with the law of comparative advantage, changes in economic efficiency brought about by increased competition, and increased production levels due to a better exploitation of economies of scale made possible by the increase in the size of the market.

The aim of the work by Muller and Owen (1985) is to analyze the last source. More precisely they consider the effect of trade on the deviation of the representative plant size from the minimum efficient technical scale (METS) at the industrial level.

2. Problems of data and specification

In our analysis for Italy we have followed the type of specification proposed by Muller and Owen (1985). The sample adopted consists of 14 industrial sectors (see Appendix A, table A1).

The sectors considered in the sample are only 14 because of the problem of matching the engineering estimates of METS with the official data on production, trade and number of plants.

A general problem with this type of data is the highly detailed disaggregation with which METS estimates are supplied. We have adopted the highest available disaggregation level (NACE 4 or 3 digits).

When official data were more aggregate than METS estimates, the implicit assumption was that these estimates are representative for the whole sector.

2)

Muller and Owen define their dependent variable as the ratio between CAPS (the average size of the largest plants accounting for 50 percent of industry output) and METS.

Such definition, although preferable in principle, has been found to be inapplicable because we lack physical output distributions by size of plant for most industries. The problems arise in variuos European countries. We had to redefine the numerator in a way that corresponds to available data.

Our first choice was the average plant size, simply defined as the ratio between total industry output and the number of plants in the industry. The results reported in Section II, 2 are referred to such definition of the dependent variable (we called it: DIMRL).

The independent variables are:

- the increase in unit costs at 1/3 of METS (COST);

- domestic market size, measured by the ratio between domestic disappearance and METS (SIZE). Domestic disappearance (or apparent consumption) is defined as Production + Imports - Exports

- export intensity measured by one plus the ratio between exports and production (ESP)

- import penetration measured by one minus the ratio between imports and domestic disappearance (IMP).

All the variables are 1982-83 averages.

As a first step, it is useful to analyze the correlation matrix (see Table 1). There is a strong positive correlation between relative plant dimension (DIMRL) and domestic market size (SIZE) (r=0.79).

Tab. 1 - Correlation matrix

	DIMRL	COST	SIZE	ESP	ESPEEC	IMP	IMPEEC
DIMRL	1						
COST	0.10	1					
SIZE	0.79	-0.02	1				
ESP	0.55	-0.51	0.63	1			
ESPEEC	0.63	-0.40	0.64	0.87	1		
IMP	0.33	0.42	0.20	-0.06	-0.03	1	
IMPEEC	0.33	0.09	0.21	-0.12	-0.17	0.53	1

Relative plant dimension is also directly correlated with export intensity (r=0.55). Further, DIMLR shows a very low positive correlation with import penetration (IMP) and a negligible correlation with the cost gradient (COST).

The correlation matrix also gives us some information about the degree of multicollinearity among our variables. The evidence in Table 1 suggests that multicollinearity is a problem in our sample: there is a high positive correlation between relative domestic market size and export intensity and a negative correlation between the cost gradient and export intensity.

This feature of our sample will have an influence on our ability to disentangle the contribution of the various independent variables in the "explanation" of the variance of the dependent variable.

3. Regression results

The results of regression analysis are presented in Table 2. We have chosen an additive linear specification with all the variables specified in their natural level. In eq. 2.1 all estimated coefficients are, as expected, positive. The positive sign of the import penetration coefficient corresponds to the "market reducing effect" hypothesis. However, only for the market size variable we can reject the hypothesis that the coefficient is zero at a significance level of 90%. The overall explanatory power of the regressione is good for a cross-section analysis (the determination coefficient is 0.69).

Tab. 2 - Regression analysis of determinants of relative plant size*: trade variables defined on a world basis. Dependent variable: DIMRL

	Constant	SIZE	COST	ESP	IMP	R2	adj-R2	F
eq. 2.1	-0.219	0.003	0.002	0.149	0.073	0.69	0.56	5.09
	(-1.14)	(2.20)	(0.81)	(1.03)	(0.79)			
eq. 2.2	0.030	0.004				0.61	0.58	19.13
	(1.27)	(4.37)						
eq. 2.3	-0.486		0.004	0.369	0.090	0.53	0.39	3.73
	(-2.77)		(1.43)	(2.97)	(0.83)			

* Figures in brackets are t-statistics

To understand whether multicollinearity creates problems in the interpretation of the results, it is useful to compare eq. 2.2 (in which all independent variables but SIZE have been excluded) and eq. 2.1. If the excluded variables had an explicative power independently from SIZE, we should observe a reduction in the adjusted R-squared of the new regression. The comparison of the two regressions reveals that this is not the case and, hence, that in our model all the explicative power is captured by the domestic market size variable.

This in not to say that there is a lack of relationship between the other independent variables and relative plant size. We have already noted from the correlation matrix that there is, for example, a relatively good positive simple correlation between export intensity and relative plant size. Moreover, eq. 2.3 shows that when relative domestic market size is omitted from the analysis, the other variables have some explanatory power. The conclusion is that variables like export intensity explain the same portion of the variance of the dependent variable as domestic market size; in other words, ESP seems not to capture elements different from those already taken into consideration by SIZE.

4. Further analysis

The conclusion exposed above seems to be in contrast with the findings of Owen (1983) and Muller and Owen (1985) concerning the role of export performance in increasing the market facing the firm through displacement of marginal competitors in the exporter's own industry.

Tab. 3 - Regression analysis of determinants of relative plant size*: trade variables defined on a EEC basis. Dependent variable: DIMRL

	Constant	SIZE	COST	ESPEEC	IMPEEC	R2	adj-R2	F
eq. 3.1	-0.743	0.002	0.004	0.429	0.013	0.79	0.70	8.62
	(-2.58)	(1.48)	(1.86)	(2.45)	(1.94)			
eq. 3.2	-0.115	0.004	0.001		0.151	0.65	0.55	6.33
	(-0.72)	(3.96)	(0.60)		(0.83)			

* Figures in brackets are t-statistics

In order to explore the role of international trade in a more complete way, we have substituted the two trade variables (ESP and IMP) with two analogous variables constructed on the basis of trade flows with the EEC (ESPEEC and IMPEEC). The results (Table 3, eq.3.1) show a clear improvement in the explicative power of the regression (the determination coefficient rises from 0.69 to 0.79). What is even more relevant is the increased role played by the two new trade variables; their estimated coefficients are significantly different from zero at a significance level larger than 90%.

A possible explanation of this result lies in the different determinants of Italian foreign trade according to the different geographical destination or origin of trade flows. More precisely, intra-EEC trade, being mainly of the intra-industry kind, finds one of its determinants in economies of scale. This characteristic is certainly less evident at the level of total Italian world trade, since part of it (especially trade with less developed countries) is explained by the principle of comparative advantage. The comparison between eq. 2.1 and eq. 3.1 stresses the relationship between relative plant size and export intensity based on economies of scale.

In relation to the other independent variables in eq. 3.1, it should be noted that the estimated coefficient of relative domestic market size loses significance with respect to eq. 2.1. This is a sign of multicollinearity, since in eq. 3.2, where the ESPEEC variable has been omitted, the significance level of the estimated coefficient of SIZE is substantially increased. Moreover, contrary to the results in Table 2, the omission of ESPEEC causes a drop in the explicative power of the regression (the adjusted R-squared falls from 0.70 to 0.55).

Therefore, the role of the export variable is strengthened in our second set of results, implying a relationship between a larger European market and the size of industrial plants.

5. Elasticities

Finally, we present tha values of the trade elasticities. These have been computed at the average level of the relevant variables. The elasticities tell us the percentage increase of relative plant size when the relevant trade variable varies by 1 percent (and all other independent variables remain constant).

Computing these elasticities both for eq. 2.1 (trade flows with the rest of the world) and for eq. 3.1 (trade flows with the EEC) we obtain the following results:

	elasticity relative to:	
Trade flows with	export intensity	import intensity
world (eq. 2.1)	2.12	- 0.58
EEC (eq. 3.1)	5.45	- 3.10

Combining these results and assuming balanced growth in trade flows, so that both export and import intensities grow by 1%, relative plant size would increase by 1.54% when we consider Italian trade with the rest of the world, and by 2.35% when we consider Italian trade with the EEC.

(3)

6. Conclusions

This study has analysed the relationship between relative plant size and a set of variables comprising relative domestic market size and trade variables.

The results have confirmed the importance of relative domestic market size in shaping the extent of suboptimal plant capacity. The trade variables, when defined relatively to Italian world trade, don't have an explicative role independent from the domestic market size variable. However, when defined relatively to Italian trade with the EEC, they tend to assume an autonomous role: the extent of suboptimal plant capacity tends to be inversely correlated to the Italian export intensity with the EEC and directly to the import penetration from the EEC.

Appendix A - Data

The main statistical sources are:

- for the METS estimates : Pratten (1987)
- for the number of plants : 1981 Census (ISTAT)
- for production data : Annuario di Statistiche Industriali (ISTAT)
- for trade variables : Annuario di Commercio Estero (ISTAT).

The sectors considered are listed in table A.1. The values of variables are reported in table A.2.

We were aware of a major weakness connected with the adoption of the average plant size as a measure of the representative plant size: the Census provides us with a number of plants which is greater than the number which can be considered economically meaningful. For this reason we have tried a first rough adjustment; we have computed the number of plants in which are enrolled the higher 90% of the employees. Similarly we have taken into consideration 90% of production and trade variables. The regression results relative to this set of "adjusted" variables are presented in Table A.3, where the dependent variable, defined as indicated above, is called DIMRL1. The results are not very satisfactory: the explanatory power is lower than that of the regressions in Table 2 and 3 and the coefficient of relative domestic market size disappears.

Tab. A.1 - List of the sectors entering our sample (in brackets are the corresponding NACE Group):

1.	Mineral Oil Refining	(140.1)
2.	Steel	(221)
3.	Cement	(242)
4.	Glass bottles	(247.2)
5.	Paint	(255)
6.	Ball bearings	(326.2)
7.	T.V. sets	(345.1)
8.	Fridges and washing machines	(346)
9.	Cars and trucks	(351)
10.	Bycicles	(363)
11.	Beer brewing	(427)
12.	Cigarettes	(429)
13.	Leather shoes	(451)
14.	Tyres	(481.1)

Table A. 2 - Values of the variable

obs	DIMRL	SIZE	COST	ESP	IMP
1	0.076950	8.447546	5.000000	1.203405	0.732884
2	0.018320	4.887607	10.00000	1.108328	0.902384
3	0.199820	30.52772	39.90000	1.013013	0.994892
4	0.079192	12.62783	11.00000	1.158928	0.944145
5	0.031180	30.36715	4.400000	1.322770	0.757259
6	0.106839	1.031556	9.000000	1.327744	0.686707
7	0.001572	4.628425	5.000000	1.307634	0.274220
8	0.014728	11.24129	9.700000	1.275459	0.992585
9	0.019133	4.278750	14.70000	1.354893	0.541265
10	0.243052	17.22676	4.000000	1.474682	0.941284
11	0.120192	4.888236	18.00000	1.007383	0.878635
12	0.009375	4.988617	3.000000	1.009719	0.238210
13	0.369171	75.28520	1.500000	1.841860	0.697140
14	0.040928	1.870389	7.500000	1.404775	0.729379

obs	ESPEEC	IMPEEC
1	1.071853	0.959930
2	1.052878	0.931055
3	1.000234	0.998286
4	1.102610	0.957359
5	1.080464	0.822852
6	1.175213	0.792949
7	1.194701	0.768975
8	1.192782	0.988244
9	1.231858	0.596886
10	1.338946	0.973909
11	1.002955	0.909688
12	1.005451	0.922388
13	1.531160	0.939696
14	1.004201	0.994773

Tab. A.3 - Regression results: dependent variable DIMRL 1*

Constant	SIZE	COST	ESP	IMP	R2	adj-R2	F
-0.657	-0.002	0.006	0.572	0.080	0.34	0.05	1.18
(-1.61)	(-0.78)	(1.12)	(1.89)	(0.43)			

* Figures in brackets are t-statistics

Appendix B - Discussion of the model

The approach adopted by Muller and Owen is derived from the work of Scherer et al. (1975). They try to explain the differences between observed and optimal plant sizes by taking into consideration location (theoretic) variables, market size variables and market imperfections variables. All the analysis relies on the assumption that plant/cost curves show increasing returns up to some minimum efficient scale, and constant returns afterwards.

Location theoretic variables

Scherer et al. (1975) show that, if unit transport costs are included in the standard cost minimizing problem, the plant size chosen will be greater the less steep is the upward slope of the unit distribution cost curve and the steeper is the downward slope of the unit production cost curve.

Assuming evenly distributed demand, circular markets and uniform costs of shipping one unit of output one radial mile, it can be shown that the slope of the unit distribution cost curve increases with freight rates and decreases with geographical demand density and with plant's share of market.

Hence a steeper slope of the unit production cost curve, lower transport costs, a higher demand density, and a higher concentration (as a proxy of market share) bring about a greater relative plant size.

Market size variables

Domestic market size can explain why plant size can be smaller than METS (minimum efficient technical scale).

First, some markets may be too small to support even a single plant of METS.

Second, even if a small market is large enough for a METS plant, on the demand side the buyers might exhibit a preference for having at least two alternative supply sources. The rational behind this preference lies in the security against total interruption of supplies and in the "bargaining power conferred by being able to play one producer off against the other".

Third, dynamic considerations should enter the analysis."The smaller the market is for any given growth rate, the more time it takes to accumulate a demand increment sufficient to absorb the capacity of a new METS plant".

Moreover, in an oligopolistic market, if firms attempt to maintain their market share in the face of a limited growth in demand, they face a trade-off between carrying excess capacity for a protracted period and sacrificing scale economies. They would be readier to carry excess capacity if METS is small relative to the market, market shares are large, and demand growth is fast.

Muller and Owen (1985) criticize the share maintenance hypothesis (also "spheres of influence" hypothesis) when referred to European business, claiming that it contradicts the observed fast growth of intra-EEC trade. In fact one of the implications of that assumption is that intra-EEC trade should have been lower in those industries where industrial concentration was higher. On the contrary, Owen

(1983) found that intra-EEC trade for most manufacturing industries was weakly positively associated to industrial concentration. As a consequence, according to Muller and Owen, seller concentration should not enter as an explicative factor in the dynamic consideration.

The domestic market doesn't represent the actual market facing the plant; also the export market should be taken into consideration. The relationship between the export market and relative plant size is similar to that between domestic market and plant size. In addition, however, Owen (1983) and Muller and Owen (1985) stress that, if an aggressive business behavior is assumed, export performance has an influence on the displacement of smaller plants in the exporting industry and not only in the importing one. The idea is based on the observation that, in a given industry, plants of different size coexist. This may be partly explained by the costs of driving out smaller high cost competitors; these costs are determined "by the short term penalties which arise from the need to operate larger capacity at below full utilization during the period prior to the withdrawal of the high cost competitor, more especially if the low cost competitor feels it necessary to reduce prices prior to the retirement of the smaller competitor" (Owen (1983), p.18). On the other side of the balance, there are "the additional profits which will accrue to the larger, low cost producer over the life of its plant as a result of driving out smaller competitors". The opportunities offered by international trade raise the expected gains of predatory actions: as a consequence the marginal producer becomes more vulnerable in both the export and the domestic market.

Import penetration may have, on an apriori ground, two contrasting effects. On the one hand, imports may spur firms to build plants of efficient size to meet or beat competition. On the other hand, imports may indicate sectors in which a country has comparative disadvantage.

Tariffs might have a residual role in explaining suboptimal plants. In this case a negative relationship between tariff levels and relative plant scale is predicted.

A further element connected with market size, is the diversity of plant's output mix. As underlined by Caves et al. (1980) and by Baldwin and Gorecki (1986), if the market for a particular product limits a specialized plant to suboptimal scale, a possible response for the manager is to diversify the plant's output mix.

The importance of considering this element stems both from recent developments in the theory of industrial organization (which specify rigorously the conditions under which production of many products in one plant is more efficient than production in many plants) and by the fact that firm's decisions as to the number of products, length of production run and number of plants are taken jointly. Unfortunately, with the exception of Baldwin and Gorecki (1986), most of the empirical literature has only taken into consideration the plant size dimension.

Principal Results

The regression analysis performed by Scherer et al. is based on a pooled sample of 12 sectors and 6 countries with data referring to the mid-sixties.

(4)

An idea of the results they obtained for the pooled sample is as follows:

$$\frac{\text{TOP 50}}{\text{METS}} = \underset{(.41)}{.59\ \text{SIZE}} + \underset{(.11)}{.14\ \text{COST}} - \underset{(.06)}{.17\ \text{TRANS}} - \underset{(.06)}{.07\ \text{DENS}} + \underset{(.10)}{.82\ \text{MS3}} + \underset{(.18)}{.13\ (1-\text{IMPORT})} + \underset{(.86)}{3.78\ (1+\text{EXPORT})}$$

(all variables in log)

(standard errors in parentheses) R2=.81

where Top 50 = average size of the largest plants accounting for 50% of industry employment or output, METS = minimum efficient tecnical scale, SIZE = ratio of domestic disappearance to the estimated METS, COST = percentage by which unit cost rises building at 1/3 METS, TRANS = transport cost per dollar of product value, DENS = product of adjusted population densities and the indices of real national income per capita, MS3 = three firm concentration ratio, IMPORT = ratio of imports to domestic consumption, EXPORT = exports as a percentage of domestic production.

International and interindustry variations in relation to METS are associated with market size, sales concentration and a set of variables reflecting the cost minimising decisions of firms serving spatially dispersed markets.

From these results two possible contrasting indications arise. On one side, the positive and significant estimated coefficient of MS3 (seller concentration measure) might be consistent with the market share maintainance hypothesis. On the other side, as noted by Owen (1983,p.31) and by Muller-Owen (1985) the elasticity of the dependent variable with respect to export performance was nearly four: this high figure cannot be explained by export performance alone. It is

suggested that this figure is consistent with aggressive business behaviour: "The sensitivity of the change in representative plant size to export performance could only have been accounted for by the displacement of smaller plants in the exporter's own industry, taking place at the same time as the drive towards export markets" (Muller-Owen, p.48)

It is difficult from this type of analysis to distinguish among these competing hypothesis.

Muller and Owen repeat the same type of analysis for West Germany alone. They don't take into consideration any location theoretic variables. Moreover assuming aggressive business behaviour, they don't consider any concentration measure.

For 1965 the result of their regression on the basis of a sample of 12 industries are:

$$\underline{\text{TOP 50}}_{\text{METS}} = -0.22 + .60\ \text{SIZE} + 0.43\ \text{COST} + 1.44\ (1 + \text{EXPORT}) + 1.84\ (1 - \text{IMPORT})$$
$$(6.31) \qquad (1.34) \qquad (1.13) \qquad (.82)$$

(all variables in log)

(t - ratios in parentheses) R2=.86

Problems of multicollinearity create difficulties in identifying the role of all independent variables with the exception of SIZE.

In a separate regression with only two indipendent variables (SIZE and EXPORT) the export performance measure is significant.

The same analysis is repeated for 1980. The regression results with METS at 1980 level is:

$$\underline{\text{TOP 50}}_{\text{METS}} = -3.48 + \underset{(6.16)}{.59\ \text{SIZE}} - \underset{(-1.08)}{.33\ \text{COST}} + \underset{(3.89)}{6.58\ (1 + \text{EXPORT})} + \underset{(5.01)}{1.21\ (1 - \text{IMPORT})}$$

(all variables in log)

(t - ratios in parentheses) R2=.79

In this case the multicollinearity problem seems less severe: both domestic and foreign markets effect are positive. The effect of imports on plant size suggests that the market reducing effect dominates the competitive pressure effect.

At this stage of the analysis Muller and Owen perform a simulation and compute the difference between the actual average plant size in the sample in 1980 and the plant size that one would expect in case the EXPORT and IMPORT variables had remained equal to their values. The result suggests that trade had the effect of doubling plant size, and that the gains in efficiency were equivalent to 20% of the original increase in trade.

Some considerations

The description above suggests us to illustrate some weaknesses of this type of empirical exercise.

First, as we have already noted, there is no strong theoretical background to these exercises. However this is a general problem with most of the empirical exercises in the field of industrial organisation.

Second, the elements of theory available suggest no clear causal link between two variables. An example is the relationship between concentration and relative plant size. It can be held that the causal link goes from concentration to relative plant size. However, there is a large body of literature suggesting that plant size is a determinant of concentration.

In the empirical exercises, the possibility of a bias in the estimated coefficient caused by this double causation link, shoul be evaluated.

Similar problems arise for the causation link between relative plant size and export intensity.

Third, as already mentioned, most of the studies don't consider that a firm takes joint decisions regarding the number of products, the length of production runs per product and multiplant operations. This a source of possible misspecification of the relationship to be estimated.

Finally, the use of engineering estimates of economies of scale is probably the best approach to measure economies of scale; however, for their nature, they impose a lot of constraints on the availability of a representative sample of industries. For example Scherer et al. (1975) adopted a sample of 8 only sectors and Muller and Owen (1985) adopted a sample of only 12 sectors.

Furthermore, the low number of observations relative to the number of independent variables, reduces the number of degrees of freedom, creating inferential problems.

All the weakness described are common to the body of economic literature existing on the topic we are dealing with. There is no short and easy way out of them: only the gradual improvement in the general availabilitu of basic informatiom will help. In the meantime, we have perfomed our exercise, providing some evidence. We feel great caution is needed in interpreting our results, as well as those of similar studies.

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II. Case studies

1. The approach adopted

Our analysis could stop here. However, there are two reasons for adding a few paragraphs.

In the first place, we have expressed motives for great caution in interpreting the Muller-Owen results; furthermore, our application of the Muller-Owen approach to Italy has been severely limited by the scarcity of the data available.

In the second place, recent literature expresses the opinion that scale economies at the plant level are less important than believed previously. The relevant economies of scale and scope in the large corporation are to be found mainly in R&D and in the distribution business (including advertising); possibly also in finance. This belief moves the core of the argument in favour of trade liberalization from the traditional variables examined by Muller-Owen and by us to a much larger set of variables.

We are not here in condition to tackle such a larger view of the benefits from integration. On the other side, even the narrow view of economies of scale in production has a widely variable validity among sectors. In a few sectoral cases, where non-tariff barriers have been maintained at a very high level, the effects of trade liberalization can be quite important. This is mainly the case of sectors dominated by public procurement. We have gathered some additional information on three such sectors: pharmaceuticals, telecommunications equipment, railways equipment.

The general conclusions from the three short sectoral studies are the following:

- the sectors considered show peculiar signs of weakness with respect to the rest of Italian industry and to the same sectors in other countries,

- such weakness is somehow related to the role played by the public authorities in controllind demand,

- and goes with fragmentation at the firm level, sometimes also at the plant level.

Pharmaceutical products

1. Introduction

In Italy, like in other countries, the government has played an active role in both the supply and the demand side of the pharmaceutical industry.

On the supply side, the areas of government intervention are mainly related to the controls over introduction of new products, the controls over drug prices and the attitude towards patent protection.

On the demand side, the government is the largest buyer of pharmaceutical products.

Before considering these two aspects, we introduce syntetically a picture of the pharmaceutical industry in Italy.

2. Dimension and internationalization : some evidence

In relation to the size distribution, in the period 1971-1981 there is an increase of 17.1% in the representative (1) plant size and of 5.4% in the representative firm size.

Among the dimensional classes, the largest relative increase is observed in the class from from 500 to 999 employees, while there is a decrease in the percentage of employees in the largest dimensional class (table 1).

The top 50% index shows an increase of 9.5% at the plant level and a decrease of 7.7% at the firm level.

For an international comparison the available data are referred to firms with more than 20 employees. Table 2 shows that in 1981 the average firm dimension was smaller in Italy than in the United Kingdom, in West Germany and in Danemark; it was similar to the one in France and larger than in Belgium.

While technical scale economies are irrelevant in the pharmaceutical industry, firm level scale economies (in R-D activities and marketing activities)are important. As a consequence the evidence that average firm dimension is lower in Italy than in two of the leading countries can be interpreted as a signal that Italian firms do not reach on average an optimal dimension.

In relation to the internationalization, we first consider the role of foreign direct investment.

In 1986 the share of foreign controlled firms in the Italian finished drug market was 58.5% (table 3). It increased in the last few years, but it has not yet reached the level it had in 1975.

The importance of foreign capital in terms of market share is high in almost all developed countries (for example, in U.K. it is 65% and in France 50%).

What differentiates Italy from other developed countries is the low profile of Italian production abroad: the share of major world markets held by Italian companies is lower than one percentage point, except in such markets as Spain, Brazil and Argentina (table 4).

Foreign trade is not very important for Italian pharmaceutical industry. In 1985 export intensity (measured as the ratio between the value of exports and the value of sales) was 18.4% and import penetration (measured as the ratio between the value of imports and domestic disappearance) was 21.4% (Table 5). When we consider only

finished drugs, the two ratios are even lower (14.1 the former and 16.6 the latter) even if they shows an increase with respect to their 1975 level.

For a comparison with other developed countries we consider data for 1982 in table 6 (2).

Export intensity of the italian pharmaceutical industry is clearly lower than the average for the EEC (15.8% compared to 31.7%). Such a gap is not observed for import penetration (in Italy it is 15.0% and on average in the EEC it is 21.8%).

In summary, Italian pharmaceutical industry, with respect to other advanced countries, has a lower average firm dimension, and lower values for export intensity and production abroad.

The two aspects are likely to be related, and to be at least partially due to a peculiar behaviour of the public authorities.

3. Public expenditure

Up to the end of the seventies there has been a continue increase in the public component of pharmaceutical expenditure. More precisely public expenditure for prescription drugs sold in pharmacy (which account for the largest part of total consumption) has continuosly increased its share of total expenditure up to 1978; after that year the share has remained approximately costant.

The incidence of Italian pharmaceutical public expenditure on GDP was, in 1986, 0.78%: this figure is lower than the one for France (0.95%) and West Germany (0.94%), but higher than the one for U.K. (o.54%) (Table B). Moreover in Italy it is decreasing after 1975, while in the other three countries there is an increasing trend.

In Italy, similarly to other countries, a new pharmaceutical product requires an official approval. In general, a new drug has to pass a test concerning its safety and its effectiveness.

When compared to those of other advanced countries, in Italy the standards required to pass the registration test have been very low.

However, in the last few years there has been an unofficial adoption of the EEC standards.

Generally, after a product has obtained official approval, firms wait for its admission in the Prontuario Terapeutico Nazionale (PTN), i.e. the list of products that the doctor can prescribe within the framework of the Servizio Sanitario Nazionale [SSN, i.e. National Health Service].

In theory, the admission to PTN is an instrument for the government to control the composition of public expenditure. However, almost all the products that obtain the registration are also included into PTN; being the selectivity of the registration very low, the PTN becomes an unexploited instrument for that objective.

One consequence of this state of affairs is that in 1981 3/4 of public consumption for finished drugs is for product classified as "less effective" (i.e. the second group) in the PTN (Table 9).

This lack of selectivity has clearly favoured national firms, which have been characterized by a low innovative content of their production.

Two other factors have favoured the maintenance of this situation. Firstly, until 1978, in Italy there has been an absence of patent protection. Secondly, the regime of administrative prices has not been qualitatively selective; the methodology adopted in setting prices didn't take into consideration the innovativeness and the therapeutic value of the product. After 1978, the new system included allowances for research contents of new products.

The approach adopted has been to favour the R-D activities localized in Italy: in setting the price an increase of 12% is recognized for innovative contents to firms which have R-D activities in Italy, while an increase of 10% is accorded to firms with R-D activities located abroad.

All these elements underline that, while government attitude favoured national companies, this didn't happen within a framework of industrial policy aimed at strengthening the ability of Italian firms to compete on international markets.

Even if in 1978 there has been some indication of change in government attitude, in 1981 the largest share of drugs produced by Italian firms was composed of products belonging to the second group of PTN; on the contrary, foreign firms had their production mainly composed by the more innovative products belonging to the first group of PTN (Table 10).

Italian firms don't have R-D laboratories able to produce a sufficient number of new products with some innovative content. This is a consequence of the delay with which some Italian firms started to devote resources to R-D activities during the 70's. The introduction

(6)

in 1978 in Italy of patent protection, required a change of strategy by Italian firms. For this reason Italian firms started to look for products to sell under license.

The results of a research conducted by Irs in 1983 on the basis of firm interviews, show that in 1975 only 32% of innovative products sales by Italian firms were based on innovations developed by others and that in 1981 that percentage rose to 61%. There are many reasons that create an incentive for the multinational firms to sign these agreements. First, it is not true that two or more sellers share a static market. In fact the summation of more marketing strategies produces an expansion of unespected dimension in consumption. This outcome is also one of the reasons behind the "cross-licensing" phoenomenon at international level. Second, the licensing agreement is in some cases, just a first step in a merger process. Finally, but not less important, Italian firms have a better knowledge of the Italian market so that they are more able to speed up the successful introduction of a new product.

4. Final comments

Although the pharmaceutical industry is not subject to public procurement, the government relied on other instruments to protect the domestic industry: registration of new drug, admission to prescription within the National Health System, patent recognition and price controls.

While economies of scale at the plant level are very low, the abolition of barriers can increase firm size. This can favour an increase in the number of specialised R-D laboratories, possibly bearing an increase in the amount and productivity of innovative expenditure.

It is not clear how Italian firms, with their actual inability to compete at an international level, can exploit the potential gains of a less fragmented European market.

On the contrary, the question is whether Italian firms will still be able to conclude license agreements with foreign multinationals in a market characterized by a free access to information and by more impartial registration systems.

Notes

(1) - Defined as the Florence median or Midpoint plant. This measure is the median of the first moment distribution (i.e. it measures the dimension of the plant which divides the population so that half of the employment comes from larger and half from smaller plants).

(2) - The figures presented in table 5 and in table 6 are not comparable because of the different definitions of the relevant industry).

Tab. 1 - Manufacture of pharmaceutical products (NACE 257)
Size distribution: plants and firms

	1971				1981			
	Employees		Plants		Employees		Plants	
	N.	%	N.	%	N.	%	N.	%
1 - 5	627	1.0	219	25.7	602	.9	213	27.4
6 - 9	731	1.2	102	11.9	659	1.0	90	11.7
10-19	2126	3.5	153	17.9	1322	2.0	96	12.3
20-49	4854	8.0	157	18.4	4443	6.8	137	17.5
50-99	5377	8.9	79	9.2	6464	9.9	92	11.7
100-199	9035	14.9	62	7.2	8362	12.8	58	7.4
200-499	19307	31.8	61	7.1	18887	28.9	63	8.0
500-999	12156	20.0	17	2	19894	30.4	28	3.6
more than 1000	6467	10.7	5	.6	4763	7.3	3	.4
TOTAL	60680		855		65396	100.0	783	100.0
M=71.0 Me=317.5 Top50%=514					M=83.5 Me=371.7 Top50%=562.8			

	1971				1981			
	Employees		Firms		Employees		Firms	
	N.	%	N.	%	N.	%	N.	%
1 - 5	415	.6	134	21.4	313	.4	95	18.4
6 - 9	536	.8	75	12.0	427	.6	58	11.2
10-19	1460	2.2	104	16.6	1040	1.5	75	14.4
20-49	3913	5.8	131	20.9	3170	4.6	97	18.7
50-99	3979	5.9	61	9.8	4779	7.0	69	13.3
100-199	6090	9.1	43	6.9	6052	8.8	43	8.3
200-499	15892	23.8	50	8.0	16006	23.3	50	9.6
500-999	10462	15.7	15	2.4	15504	22.6	22	4.2
more than 1000	24079	36.0	12	1.9	21413	31.2	10	1.9
TOTAL	66826		625		68704	100.0	519	100.0
M=106.9 Me =554.0 Top50%=1315.5					M=132.4 Me=583.9 Top50%=1213.8			

M = average size
Me = Florence Median
Top 50% = average size of the largest plants (firms) covering 50% of the employees

Source : ISTAT, Census

Tab. 2 - Manufacture of pharmaceutical products (NACE 257) - 1981
International comparison of size distributions: firms

	Employees % 20-99	% 100-499	% more than 500	N. Total	M
Italy	8.9	34.6	56.6	64336	253.3
West Germany	n.a	n.a	67.7	86376	319.9
France	9.6	44.8	45.7	63205	242.2
Belgium	15.3	34.1	50.6	9960	195.3
United Kingdom	4.7	16.6	78.7	68432	488.8
Denmark	5.0	24.4	70.6	7229	425.2
	Firms				
Italy	51.2	36.6	12.2	254	
West Germany	n.a	n.a	13.7	270	
France	45.6	41.8	12.6	261	
Belgium	60.8	29.4	9.8	51	
United Kingdom	42.9	34.3	22.9	140	
Denmark	41.2	35.3	23.5	17	

Note: M = average firm size
Source : Eurostat

Tab. 3 - Share of domestic market controlled by foreign capital
(% sales of finished drugs)

	1975	1984	1985	1986
Italy	63.9	56.0	57.1	58.1
France	46.2			50.0
West Germany	31.8			35.0
United Kingdom	63.0			65.0
USA	21.6			(1)22.0

(1) 1985

Source: Farmindustria, "Indicatori Farmaceutici"

Tab. 4 - Market share of italian firms in some foreign countries

Market	1973	1983
West Germany	.2	.8
France	.1	.2
United Kingdom	.1	.3
Spain	2.7	3.5
USA	--	.4
Canada	--	.2
Japan	--	--
Brasil	4.6	3.4
Argentina	n.a	2.3
Messico	2.7	n.a

Source : Lucioni (1983)

Tab. 5 - Exposure to international competition

	Total		Finished Drugs		
	1985	1986	1975	1985	1986
Export Intensity	18.4	17.0	8.8	14.1	11.9
Import penetration	21.4	22.0	9.1	16.6	16.7

Source : our elaborations from data in Farmindustria, "Indicatori Farmaceutici"

Tab. 6 - Exposure to international competition

	export intensity	import penetration
	1982	1982
Italy	15.8	15.0
Germany	30.4	19.5
UK	37.9	19.0
France	23.8	12.3
EEC	31.7	21.8

Source : our elaboration from data in Burstall (1985)

Tab. 7 - Private and public expenditure of prescription drugs in pharmacy

	Total expenditure (billions lire)	Public exp. %	Private exp. % ticket	Private exp. % out of the pocket
1965	473	60.9	--	39.1
1975	1539	64.7	--	35.3
1978	2224	80.7	3.7	15.6
1979	2474	75.8	11.3	13.5
1980	3190	82.0	9.9	8.1
1982	5150	83.6	7.1	9.3

Source : Lucioni (1986)

Tab. 8 - Incidence of pharmaceutical public expenditure on GDP (%)

	Italy	France	West Germany	U.K.
1965	.74	.83	.46	.41
1970	.79	.84	.66	.41
1975	.91	.89	.86	.43
1980	.67	.77	.84	.50
1985	.86	.90	.90	.53
1986	.78	.95	.94	.54

Source : Farmindustria

Tab. 9 - Composition of public consumption for finished drugs

	1978	1979	1980	1981
Share of products				
- belonging to I group	18.8	21.2	23.7	25.0
- belonging to II group	81.2	78.8	76.3	75.0

Source : Lucioni (1983)

Tab. 10 - Analysis of sales according to nationality of firms and to groups of PTN - 1981

	Italian firms	Foreign firms
Share of products sold belonging to		
- I group	38.7	22.7
_ II group	61.3	77.3

Source : Lucioni (1983)

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Telecommunications Equipment

1. Introduction

It is widely recognized that in Italy there is a fragmented and overlapping set of telecommunications institutions.

The government has a legal monopoly of the provisions of basic network services. Actually, the services are provided in part directly by the Ministry of Posts and Telecommunications (PT) and partly by licensed private, but government-owned, companies (SIP, Italcable and Telespazio).

The distribution of duties among the various firms reveals a very complicated structure. Within the Ministry of PT there are two main organizations, each one with its own budget. The Posts and Telecommunications Administration provides all domestic and part of the international telegraph and telex services; the ASST (Azienda di Stato per i Servizi Telefonici) provides international telephone services with all European and part of the Mediterranean countries; it also handles the domestic trunk services between 37 districts. The largest licensee, SIP, provides all local telephone services and part of the domestic trunk services. Italcable handles international telegram services and intercontinental telephone, telegram and telex services. Finally, Telespazio provides the installation and operation of the ground equipment of telecommunication via satellite.

2. Public procurement

From a technical point of view only the purchasing activities of the government-owned firms should be considered as public procurement. However, it would be misleading to consider the activities of a firm like SIP, which is a licensee by the government, is organized into a state holding group (STET) and is the largest buyer of the sector, as purely private operations (Pontarollo (1983)).

SIP's purchasing system is based on a Memorandum, released at the beginning of every year, which includes the plan of the total value of annual purchases and an updating of the price level. In its purchasing policy SIP has generally respected the "historical market shares" principle. This kind of behaviour has been favoured both by structural characteristics of the industry and by technological characteristics of the products. In relation to the former, the monopsonistic structure of the industry, together with the right of the monopsonist to set technical standards, creates an incentive towards collusion among the producers to riequilibrate the balance of power. Also technological factors have favoured a stable relationship between the suppliers and the buyer; electromechanical switches, for example, are usually installed for a given capacity, which can be increased at decreasing costs. As a consequence, once the original contract is assigned to a firm, the works of expansion are assigned to the same firm.

An important feature of SIP's attitude has been the constant attention to the evolution of Italtel, which is a manufacturer belonging to the same state holding as SIP. An example is the decision

by SIP to slow down the conversion of the network from electromechanical to electronic technology, waiting for Italtel to produce its own system. In fact Italtel (which has the largest market share for public switches) was rather slow in developing the necessary skills for the electronic technology in public switches.

The second largest buyer in Italy is ASST. Differently from SIP, it is required by law to call for competitive tenders for the supply of telecom equipment and systems. Usually, the invitation to tenders is made to companies operating in Italy. However, this kind of protection has not been accompanied in Italy, differently from other countries, by the elaboration of detailed technical standards.

3. Some characteristics of industry structure and performance

3.1. Dimension: plants and firms

Table 1 shows the evolution of plant size distribution between 1971 and 1981. During this period there has been a reduction in average plant dimension (from 153.1 to 105.4 employees). In terms of size distribution the largest relative decrease can be observed in the highest dimensional class, while the largest relative increase is for plants of 200 to 499 employees.

This evolution is a sign of the restructuring in the industry following the progressive introduction of new technologies which are less labour intensive (for example the passage from the electromechanical to the electronic technology in public switches).

In relation to economies of scale at the plant level, recent estimates reported in the survey paper by Pratten (1987) show how the increase in unit costs below minimum efficient scale (MES) for the

production of exchanges are not very high (5-10% at 1/3 MES in West Germany and 4.5% at 1/2 MES in the United Kingdom). At a more qualitative level, it has been suggested that until recently "because the processes involved assembling a large number of component parts to produce the final product, the design and organization of the manufacturing and assembly process may have improved as cumulative output increased, so that unit costs declined with scale of production" (OECD, 1983 pg.34). The technological evolution which has characterized almost all product segments of this sector, has shifted the main source of economies of scale at the firm level to R-D activities. The evolution of R-D expenditures has been characterized by the strong increase in fixed investments for the acquisition of the basic principles of the new technology and by the necessity to produce continuous and sistematic innovations along given technological trajectories.

The introduction of new technologies has started in different countries at different periods. For example, West Germany and Italy are clearly latecomers in the introduction of electronic technology in public switches, when compared to France, the United Kingdom and the United States (Table 2).

As a consequence, an international comparison of firm dimension should be interpreted taking into consideration these elements. The fact that in 1981 average firm dimension was in Italy and West Germany, higher than in the United Kingdom and in France (Table 3), is partly explained by the delay in the substitution of electromechanical (more labour-intensive) with semielectronic and digital technologies in the former countries.

3.2. Concentration

In the production of public switches, Italy has an anomalous supply structure characterized by a high number of manufacturers relatively to domestic market dimension (Table 4) (1).

In 1984, Italtel (part of the state holding IRI-STET) had a market share of 50.3%, Telettra (part of the FIAT group) had 2.6%, GTE Italy (Siemens) had 12.6%, Face (Alcatel Nv) had 14.2% and Fatme (Ericsson) had 20.3%. It can be also observed how market shares of the five firms fluctuated only marginally during the last ten years; this evidence is in line with the already discussed "historical market shares" principle.

Evidence on the fragmentation of Italian industry of public switches relatively to that of other countries, is presented in Table 5. Italy is the only country having four suppliers, each one with a share of more than 10% of the market. Moreover, in Italy the producers offer three different switching systems (UT, Axe, 1240), while in most other European countries only two switching systems are allowed.

This situation is in evolution because of the decision in 1982 by CIPE (the government Committee for Economic Planning) to reduce the number of suppliers of digital switches to two. As a consequence, Italtel, GTE and Telettra decided to set up the so-called National Pole for the unification and development of switching systems. Successively, Italtel and Telettra decided a process of merger with the creation of a new company, Telit; the agreement collapsed in November 1987.

Whenever the reduction to two switching systems should take place, either Fatme of Face would be the second supplier. The result would depend on the configuration of the international agreements

concluded by the National Pole. What is certain, neither wants to exit from the market. Actually, both of them are operating with more manpower than is really required; the aim of this behaviour is partly linked to the desire to maintain their bargaining power.

A further element revealed by Table 5 is the strong penetration of foreign capital in Italy in comparison to what has happened in countries like France, West Germany and the United Kingdom. Rather than a signal of openness, it is the result of the technological backwardness of the country.

The market for transmission equipment is characterized by a similar fragmentation on the supply side, but this is not anomalous with respect to the experience of other countries.

The largest supplier is Telettra (34% of the market) followed by Italtel (24%) and GTE (15%) (Table 6). In comparison to public switches there is a new large supplier: the British company, Marconi (10%). Also in this market there is a large presence of foreign capital.

In terms of the attitude of SIP towards Italtel, it is interesting to compare data for the whole market of transmission equipment in Table 6 with data referred to that portion of the market generated by SIP purchases (Table 7). It is evident how larger is the share of the latter market detained by Italtel.

For the terminal equipment market, indications are similar to those for the previous markets in terms of fragmentation and the presence of foreign companies. The evidence in 1985 for three products of this segment of the industry is presented in Table 8.

3.3. Foreign trade

Telecommunication industry is characterized by a positive trade balance (Table 9). This result is in line to what happens in other countries with the notable exception of the United States (Cozzi-Genco, 1987).

Disaggregating the flows of international trade by area of origin and destination, it can be observed that the origin of Italian trade surplus is due to the high surplus with non-Oecd countries which more than compensates for the deficit with Oecd-countries (Table 10).

A final useful information can be obtained from Table 11: export intensity for the whole industry (defined by the ratio of the value of exports to the value of production) has been around 20% during the period 1980-1984. Import penetration during the same period has fluctutated between 12% and 14.5%. However, when we consider data at the firm level, we can observe very disparate performances: for example, Italtel has a very low export intensity (around 6%), while Telettra has a very strong exposure to international competition (export intensity is more than 50%).

4. Final comments

The completion of the internal market will affect the telecommunication industry, mainly in opening up competition in the public procurement area and in the homogeneization of technical standards.

These measures imply an enlargement of the market actually facing the firm. Given the existence of scale economies, particularly in R-D activities, this evolution should bring about an increase in efficiency at the EEC level.

Moreover, integration can have two other positive effects at the EEC level (2). The first effect relates to allocative efficiency; it is likely that the passage from a protected to a liberalized situation will increase competition.

Secondly, the completion of the internal market can be also interpreted as a strategic trade policy (defined as a policy "aimed at securing national advantage in oligopolistic industries") at the EEC level. In fact, additional benefits can be obtained by the strengthening of the competitiveness of European firms vis-a-vis US and Japanese rivals.

The liberalization of the telecommunication market is also favoured by the autonomous evolution of the industry. The distribution of world demand between systems and equipments for public networks and private systems and terminals should gradually shift in favour of the latter. According to Dataquest in the period 1986-1990 the average incidence of private systems and terminals will be 37.4%; it will increase to 44.9% during the period 1991-1995 and to 55.1% during the period 1996-2000.

This means a shift towards a segment which is already characterized by a high degree of liberalization.

The evolution in Italy is similar to the one for the world as far as the general tendency is concerned. However, public switches, while losing some ground, should maintain the largest share of the market in the next ten years. This is mainly due to overlapping between additional demand (which is far from saturation) and renewal demand.

Considering the effects of the completion of the internal market at the Italian level a clear benefit will arise from the increase in competition.

However, one important element to consider is the ability of Italian firms to survive international competition. In fact, the telecommunication industry can be considered a "strategic sector" because of the generation of external economies mainly via spillover effects of R-D activities.

As we have already seen, some Italian firms are already competing successfully in some segment of the industry (for example, Telettra in transmission equipment); other firms, on the contrary, have had a very low exposure to international competition because of the protection they received. However, it is difficult to draw conclusions on this point because of the fast evolution in the oligopolistic configuration of the industry at the world level.

Note

(1) - Data in Table 4 are relative to purchases by SIP which is the largest buyer. The remaining part of demand is covered by ASST (150 bn lire in 1984) and by Italcable.

(2) - Krugman (1986).

Tab. 1 - Man. of telecomm. equipment, electrical and electronis equipment (Nace 344.2) - Size distribution: plants and firms

	1971				1981			
	Employees		Plants		Employees		Plants	
	N.	%	N.	%	N.	%	N.	%
1 - 5	254	.6	99	37.2	477	.8	202	36.5
6 - 9	238	.6	32	12	489	.8	68	12.3
10-19	606	1.5	43	16.2	1188	2.0	88	15.9
20-49	1162	2.8	36	13.5	2156	3.7	70	12.7
50-99	1336	3.3	18	6.8	2957	5.1	41	7.4
100-199	2546	6.2	17	6.4	4650	8.0	33	6.0
200-499	1874	4.6	6	2.3	8503	14.6	28	5.1
500-999	4013	9.8	5	1.9	5340	9.2	9	1.6
more than 1000	28692	70.4	10	3.8	32530	55.8	14	2.5
TOTAL	40721		266		58290		553	
M= 153.1					M=105.4			

	1971							
	Employees		Firms		Employees		Firms	
	N.	%	N.	%	N.	%	N.	%
1 - 5	221	.5	84	38.5	400	.7	172	43.4
6 - 9	201	.4	27	12.4	383	.7	54	13.6
10-19	527	1.2	37	17.0	830	1.5	61	15.4
20-49	936	2.1	30	13.8	1347	2.4	43	10.9
50-99	1152	2.6	15	6.9	1621	2.8	23	5.8
100-199	2188	4.9	15	6.9	3031	5.3	21	5.3
200-499	359	.8	1	.6	4642	8.2	14	3.5
500-999	2583	5.7	4	1.8	784	1.4	1	.2
more than 1000	36727	81.8	5	2.3	43750	77.0	7	1.8
TOTAL	44894		218		56788		396	
M = 205.9					M=143.4			

M = average plant size

Source : ISTAT, Census

Tab. 2 - Shares of switching technologies (1 January 1985)

Technology	Italy	France	United Kingdom	West Germany	Usa
Electromechanical	96	63	79	97	38
Semi-electronic	1	15	20	2	50
Electronic (digital)	3	22	1	1	12
Total	100	100	100	100	100

Source : Italtel

Tab. 3 - Man. of telecomm. equipment, electrical and electronic equipment - 1981
International comparison of firm size distribution

Employees

	20-99 %	100-499 %	more than 500 %	Total number	M
Italy	5.3	13.8	80.9	59035	493.9
West Germany	4.6	10.6	84.8	358398	613.7
France	12.4	15.3	72.3	105239	257.9
United Kingdom	6.4	21.3	72.2	228820	370.3
Denmark	13.6	33.2	53.2	12289	204.8

Firms

Italy	57.4	34.4	8.2	122
West Germany	60.3	28.9	10.8	584
France	73.3	19.9	6.9	408
United Kingdom	50.8	34.5	14.7	618
Denmark	61.7	28.3	10.0	60

Note: M = average firm size
Source : Eurostat

Tab. 4 - Public switches: shares of the market generated by SIP's purchases

		1976		1984	
		(bn.lira)	%	(bn.lira)	%
ITALTEL	IT	179.4	55.0	609.2	50.3
TELETTRA	IT	.3	.1	32.1	2.6
GTE	D	30.5	9.4	53.0	12.6
FACE	F	55.6	7.0	171.3	14.2
FATME	SW	60.5	18.5	246.3	20.3
TOTAL		326.0	90.4	1211.9	83.1
Others		34.6	9.6	246.9	16.9
TOTAL		360.9	100.0	1458.8	100.0

Source : SIP

Tab. 5 - European market in public switches.
Market shares - 1987

Country	Siemens	Ericsson	Alcatel NV	Plessey and GEC	Italtel	ATT/ Philips
Austria	26.3	--	26.3	--	--	--
Belgium	20.0	--	80.0	--	--	--
Danemark	38.9	50.0	11.1	--	--	--
EIRE	--	50.0	50.0	--	--	--
Finland	27.8	27.8	--	--	--	--
France	--	--	85.2	--	--	--
Greece	40.7	--	--	--	--	18.5
Italy	11.4	19.0	14.3	--	55.2	--
Netherlands	--	19.4	13.9	--	--	66.6
Norway	--	42.9	57.1	--	--	--
Portugal	50.0	--	50.0	--	--	--
Spain	--	29.6	70.4	--	--	--
Sweden	--	88.5	--	--	--	--
Switzerland	33.3	33.3	33.3	--	--	--
United Kingdom	--	16.2	--	68.4	--	--
West Germany	75.1	--	24.8	--	--	--
Europe	20.0	15.0	35.0	10.0	7.0	3.0

Source : our elaboration from Zanetti (1987)

Tab. 6 - Distribution of Italian market for Transmission Equipment (excluding mobile radio) - 1984

	%
Telettra	34
Italtel	24
GTE	15
Marconi	8
Face	2-3
Fatme	3-4
SIAE	2
Selenia	less than 2
Philips	3-4

Source : Estimates by Telettra

Tab. 7 - Distribution of the market generated by SIP purchases of transmission equipment - 1984

	%
Telettra	35
Italtel	33
Marconi	17
GTE	11
Fatme	2
Selenia	2

Source : estimates by Telettra

Tab. 8 - Distribution of italian market for terminal equipment - 1985

	Telephones		Modems		PBX	
Sales (bn. lira)	170		54		380	
Market shares (%)						
	Italtel	40	Are	31.2	Italtel	32.2
	Face	20	Motorola	20.6	Safnat	13.0
	Fatme	10	Italtel	18.8	Fatme	11.8
	Others	30	IBM	9.4	Telettra	7.2
			Philips	6.5	Olivetti	6.8
			Others	13.5	GTE	5.1
					Face	3.9
					Others	20.0

Source : Zanetti (1987)

Tab. 9 - Foreign trade and production (bn lira)

	1980	1981	1982	1983	1984	1985
Production	1577	2041	2593	3094	3733	--
Import	214	231	294	3480	464	544
Export	317	366	561	576	628	756
Trade Balance	103	135	267	228	164	211

Source : Campo dall'Orto-Mariotti (1986)

Tab. 10 - Italian foreign trade in TLC narrowly defined (SITC 7648) and broadly defined (SITC 764) (million $). 1985

	SITC 764			SITC 7648		
	Import	Export	(X-M)	Import	Export	(X-M)
World	598	831	233	105	229	124
OECD	533	347	-186	93	34	-59
EEC	252	184	-68	41	12	-29
NON-OECD	59	484	425	11	195	184

Source : OECD Series B

Tab. 11 - Italian export intensity and import penetration

	1980	1981	1982	1983	1984
Export Intensity	20.1	17.9	21.6	20.5	17.6
Import Penetration	14.5	12.1	12.6	12.4	13.0

Source : Elaborations from Tab. 9

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Railways equipment

1. Introduction

Until 1985, approximately 4/5 of the demand facing the firms operating in this sector was due to Ferrovie dello Stato (F.S., the government owned railway company).

If we partition the sector, on one side, in terms of the functional and technological characteristics of the products (mechanical and electrical) and, on the other side, in terms of type of utilization of the product (heavy and light), we observe (Table 1) that the largest part of the market is covered by the heavy segment. The demand for this product is almost entirely due to F.S.

This characteristic has strongly shaped Italian industry. No firm in this industry was born or has developed independently from the demand of F.S. Various elements characterize this dependence from F.S.

First, F.S.'s purchasing decisions are linked to the financing laws approved by the Parliament. This has created uncertainties surrounding both the timing and dimension of demand. As a consequence, the industry has suffered periods of excess capacity (on average in the last few years utilization has been around 70% of total capacity).

Second, firms had F.S. as their main point of reference for the development of industrial products. Moreover, F.S. had, especially in the past, an active role in project formulation and development of products with the consequence of not stimulating autonomous innovative ability in the firms.

A final element is the high protection guaranteed by public procurement. To each tender only those firms recognized as official suppliers of F.S. are admitted . This guarantees a protection from new entries in the industry. Moreover, this is reinforced by the existence of historical shares on the basis of which the purchasing orders are partitioned.

2. Fragmentation and international competitiveness

This situation has favoured the shaping of an industry characterized by a high degree of fragmentation and a law ability of competition on international markets.

In relation to fragmentation, Table 1 shows the size distribution. In 1981 the representative plant had 633.2 employees; and the representative firm had 715.0. Between 1971 and 1981 there has been a strong increase in dimension: representative plant size increased by 78.8% and representative firm size increased by 51%. Similar indications arise when we consider average size of the largest plants (firms) employing 50% of employees.

Notwithstanding this increase in dimension, in 1981 Italian industry was still more fragmented than the one in the other major countries in the EEC. Infact, Table 2 shows that in 1981 the average dimension of firms with more than 20 employees was smaller than in France, in West Germany and in the United Kingdom.

The public sector is strongly involved in this sector also on the supply side. Two state holding groups operate in this sector: EFIM and IRI. The former is mainly involved in products characterized by mechanical technology, the latter in products of electrical technology, diesel engines and steel products.

To understand the role played by the firms belonging to public groups, it is useful to analyze the distribution of employment among the firms in the various segment of the industry characterized by the different technological feature of the product.

Table 3 shows the employment distribution among groups supplying products characterized by the mechanical technology. The EFIM group has the largest share of blue collars in this segment (26.2%) and it is followed by the private group FIREMA (21.1%). The only presence of foreign capital is represented by Brown Boweri with 1.3% of total blue collars.

In the electric-traction segment the largest share is held by IRI (43.7% of total blue collars), followed by Brown Boweri with 19.2% (Table 4).

Finally, in the segment characterized by fixed electrical installations, the highest concentration of blue collars is in the IRI group (35.9%), followed by foreign groups like Brown Boweri and Ericsson (11.3% and 11.8% respectively) (Table 5).

The last three tables show a strong presence of the public sector on the supply side.

The degree of concentration is lower than in other countries. Only one segment of the industry shows a four-firm concentration ratio comparable to the one prevailing in other countries (about 90%): products based on electrical-traction technology. Other segments have

lower degrees of concentration: both production of electrical fixed installations and production of mechanical-traction products show a four-firm concentration ratio at about 70%. In France, for example, the least concentrated segment shows a four-firm concentration ratio of about 85%.

The exposure to international markets of Italian firms is very low: in 1982 the ratio of exports on sales was 5.1% (Table 6).

The low competitiveness of Italian firms on international markets is presented in Table 7: Italy has the lowest share in the exports of the largest producing countries (3.5% in the period 1973-77 and 4.4% in the period 1979-83). Moreover a low export market share is also characteristic of most of the products in this sector (Table 8).

The results of a research cited in Mercurio (1985), analyzing the differences in the determinants of good performance on the domestic and on the international market, show that the differences are linked to the divergent characteristics of a closed and protected market relatively to an open market. These divergences characterize the reailway equipment sector in all industrialized countries with an autonomous domestic industry. Moreover, in Italy, differently from the other countries, the special kind of relationship existing between the demand and the supply side of the market have reduced the firms' ability to compete on international markets. For example, as already mentioned, autonomous innovative ability has never been stimulated by F.S.. An indirect indication of the protection of the domestic market is presented in Table 6. In fact, from the inability, on average, of Italian firms to compete at an international level, one should expect

a strong penetration of imports on the domestic market. However, this is not the case: in 1982 imports were only 2.8% of domestic disappearance.

Moreover, foreign production is represented with a significative market share only by Brown Boveri in the traction segments of the industry (Tables 3 and 4). In the electrical fixed installations segment of the industry, there is a strong presence of foreign production.

3. Final comments

The synthetic discussion of the industry presented in the previous sections has underlied the fragmentation and low international competitiveness of the Italian industry.

The completion of the internal market can have positive effects because of the enlargement of the market actually facing the firm and the consequent better exploitation of economies of scale.

However, since the increase in competition will also have the effect of marginalize the inefficient producers, one should also ask whether Italian firms will be able to survive foreign competition. We have already noted that the exposure to foreign competition has been on average very low.

However, the indication at the firm level are less pessimistic. An example is given by Breda whose share of exports on sales has been around 25% in the last few years. Moreover, an analysis of the strategies of the leaders in the two segments of this industry (i.e. Breda and Ansaldo), shows that they are oriented towards international competition (Mercurio (1987)).

Even if these elements don't provide a clear-cut answer to the original question, it is possible to say that a progressive liberalization of European markets will reduce the degree of fragmentation of the Italian industry and offer Italian firms the opportunity of a better exploitation of scale economies.

Tab. 1 - Percentage distribution of the market according to its segments :

	Heavy Traction	Light Traction	Total
Mechanical	61	3	64
Electrical	29	7	36
- Traction	19	2	21
- Fixed installation	10	5	15
Total	90	10	100

Source : Mercurio (1987)

Tab. 2 - Manufacture of railway equipment (NACE 362)
Size distributions : plants and firms

	1971				1981			
	Employees		Plants		Employees		Plants	
	N.	%	N.	%	N.	%	N.	%
1 - 5	53	.3	16	15.6	56	.2	23	18.1
6 - 9	77	.5	10	9.7	84	.3	11	8.7
10-19	323	2.2	23	22.3	146	.5	11	8.7
20-49	478	3.2	14	13.6	564	2.0	18	14.2
50-99	503	3.4	7	6.8	636	2.3	10	7.9
100-199	1282	8.6	9	8.7	1787	6.5	12	9.4
200-499	5750	38.6	16	15.5	7284	26.4	21	16.5
500-999	4662	31.3	7	6.8	12213	44.2	17	13.4
more than 1000	1776	11.9	1	1.0	4863	17.6	4	3.1
TOTAL	14904		103		27633		127	
M=144.7 Me=354.1 Top 50%=475.2					M=217.6 Me=633.2 Top50%=842.5			

	1971				1981			
	Employees		Firms		Employees		Firms	
	N.	%	N.	%	N.	%	N.	%
1 - 5	30	.3	7	10.3	25	.1	9	12.5
6 - 9	43	.4	6	8.8	61	.3	8	11.1
10-19	249	2.1	18	26.5	134	.9	10	13.9
20-49	402	3.5	11	16.2	396	2.3	13	18.0
50-99	340	2.9	5	7.3	327	1.9	5	6.9
100-199	119	1.0	1	1.5	496	2.8	3	4.2
200-499	4711	40.7	13	19.1	4052	23.3	11	15.3
500-999	4582	39.6	6	8.8	7430	42.7	10	13.9
more than 1000	1083	9.4	1	1.5	4463	25.7	3	4.2
TOTAL	11559		68		17384		72	
M=169.9 Me=491.6 Top 50%=791.7					M=241.4 Me=715.0 Top50%=999.1			

Source : ISTAT, Census

Tab. 3 - Manufacture of railway equipment (NACE 362)
International comparison of firm size distribution: 1981

	Distribution of Employment by Firm Size				
	20-99 %	100-499 %	more than 500 %	TOT N.	M
Italy	4.9	25.7	69.4	15906	353.5
West Germany	n.a	n.a	n.a	11270	450.8
France	6.1	27.4	66.5	16624	377.8
United Kingdom	1.7	5.0	93.2	46509	1291.9
	Distribution of Firms by Size				
Italy	40.0	31.1	28.9	45	
West Germany	n.a	n.a	n.a	25	
France	43.2	36.4	20.5	44	
United Kingdom	47.2	33.3	19.4	36	

Note: M = average for firm size
Source : EUROSTAT

Tab. 4 - Products characterized by mechanical technology
Share of total employment

	Employees %	Blue collars %
EFIM	25.6	26.2
IRI	2.5	2.3
FIAT	11.1	8.1
FIREMA	22.5	21.1
BROWN BOVERI	1.4	1.3
OTHERS	36.5	40.8

Composition of varions groups :

EFIM : Breda C.F., Imesi, Sofer, Omeca, Ferrosud, Officine Reggiane
IRI : Isotta Fraschini
FIAT : Fiat Ferroviaria Savigliano
FIREMA : Officine Fiore, OMC, Officine Stanga, Officine Cittadella, Officine Casaralta
BROWN BOVERI : Tecnomasio Italiano Brown Boveri

Source : Mercurio (1987)

Tab. 5 - Products characterized by electrical technology (tractian). Share of total employment

	Employees %	Blue collars %
IRI	57.0	43.7
BROWN BOVERI	11.0	19.2
FIREMA	19.3	15.6
FIAT-PARIZZI	7.8	8.3
OTHERS	4.9	13.2

Composition of varions groups :

IRI : Ansaldo Trasporti
BROWN BOVERI : Tecnomasio Italiano Brown Boveri
FIREMA : Ercole Marelli Trazione, Metalmeccanica Lucana
FIAT : Elettromeccanica Parizzi

Source : Mercurio (1987)

Tab. 6 - Electrical fixed installations Share of total employment

	Employees %	Blue collars %
IRI	40.6	35.9
BROWN BOVERI	12.3	11.3
ERICSSON	8.7	11.8
ITT	8.0	9.3
CIR	3.4	4.5
WESTINGHOUSE	15.9	10.2
OTHERS	11.1	17.0

Composition of varions groups :

IRI : Ansaldo Trasporti
BROWN BOVERI : Tecnomasio Italiano Brown Boveri, S.A.E.
ERICSSON-SETEMER : Fatme, Scarpini, Sielte
ITT : Siette, Parisini
CIR : Sasib
WESTINGHOUSE : Wabco Westinghouse Segnali

Source : Mercurio (1987)

Tab. 7 - Exposure to international competition

	Export intensity	Import penetration
1981	8.0	4.1
1982	5.1	2.8

Source : our elaboration on data from ISTAT

Tab. 8 - Share in the export of the 9 largest producing countries

	average 1973-77	average 1979-83
Italy	3.5	4.4
France	24.9	19.8
West Germany	16.4	18.3
United Kingdom	4.3	10.1
USA	24.0	14.7
Canada	5.0	10.1
Japan	21.9	22.6
TOTAL	100	100

Source : ONU cited in Mercurio (1987)

Tab. 9 - Export market share of the principal European exporting countries (average for years 1975-81)

	Electrical locomotive	Parts of locomotive	Other locomotives	Passengers railway-cars	Freight car	Workshop car and railway equipment	Signal installations
Germany	18.5	37.7	40.9	17.4	30.0	11.4	28.7
France	27.7	17.4	7.0	0.6	45.3	3.1	15.9
Switzerland	27.0	6.4	2.6	0.1	4.4	18.7	8.3
Austria	--	2.8	--	0.1	0.9	38.7	5.2
Total	83.2	64.3	50.5	18.2	80.6	71.9	58.1
Italy	1.0	3.4	2.2	1.5	1.4	9.3	1.4
Others	15.8	32.4	47.3	80.3	18.0	18.8	40.5

Source: OCDE, cited in Mercurio (1985)

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