RESEARCH ON THE "COST OF NON-EUROPE"

BASIC FINDINGS

VOLUME 2

STUDIES ON THE ECONOMICS OF INTEGRATION

Document

COMMISSION OF THE EUROPEAN COMMUNITIES

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CHAPTER 1

Introduction

1.2

This volume contains the economic studies which have been undertaken as part of the research programme on the 'Costs of Non-Europe', a programme which was launched in 1986 and completed in early 1988.

The 'Cost of Non-Europe' project, funded and undertaken by the European Commission, has sought to establish the cost of the present market fragmentation of the European Community and thus, the potential benefit to be derived from the removal of market barriers.

From the beginning, it was clear that this would be a complex task. On the one hand it was necessary to examine what kind of changes could be expected in a number of important sectors and the impact that certain key liberalisation measures might have, such as removing technical barriers, border related controls and administrative formalities and public procurement restrictions; executive summaries of the sectoral and thematic studies that address these questions are to be found in volume 1 of this series.

At the same time, it was evident that the combined and inter-related effect of all the changes would profoundly influence the way in which economic and commercial activity was organised in the Community. It was necessary, therefore, to both fully investigate these effects and to develop an analytical framework which would evaluate them in a consistent fashion.

This was particularly true for the benefits that might be expected from greater market integration. Such benefits comprise the gains that appear from increased competition, from improved technical efficiency, from the exploitation of scale economies and from the encouragement of innovative activity, both in terms of technical progress and in the development of new products and services.

These integration effects, despite their extreme importance, are difficult to quantify. To come to grips with the problem and to try and establish a satisfactory methodology, the Commission organised in December 1986 a Round-Table meeting in which a number of economic experts participated.

1.3

The discussion at that meeting was wide-ranging[1] even if the initial focus was on economies of scale. One of the important features of commercial activity in the Community to date has been the dramatic increase in intra-industry trade. The phenomenon of intra-industry trade can be explained by the presence of economies of scale in the production and provision of differentiated goods. Free trade allows both lower unit costs due to the scale effects of producing for larger markets and increased variety via two-way trade in differentiated goods. But it is also important to consider the aspect of technical efficiency. The opening of markets and expansion of trade can produce benefits in addition to those arising from scale and variety because the presence of foreign competition can diminish the oligopoly power of domestic companies and exercise a positive impact on X-inefficiency.

One of the important points to emerge, therefore, from the discussion was that market power was a key issue. Not only were the benefits of market integration sensitive to market structure but that the question of competition and merger policy at a Community level, to combat the emergence of oligopoly power in a larger market, would be extremely important. The potential benefits of lower trade barriers in Community sectors characterised by scale economies and imperfect market structures could be substantial.

Another conclusion of the Round-Table meeting was the need for a number of methods to tackle such a complex problem, if only because alternative approaches would produce a check on the results obtained. It is in this fashion that the research programme on the 'Cost of Non-Europe' was developed and refined.

An industrial survey of 11,000 companies in the Community has produced a wealth of qualitative and quantitative information on the extent of existing barriers to trade and business activity and on the expected changes in costs and sales that would follow internal market completion.

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1 The bibliography at the end of this volume provides the background.

The results of this survey are reproduced and analysed in volume 3 of this series. At the same time an analysis of existing price differences for consumer and investment goods in the Community (Chapter 7, European Economy no. 35, European Commission, 1988) has indicated the potential for price convergence and lowering in a unified market.

The contents of the present volume reflect two requirements of the research programme on the 'Cost of Non-Europe'. The first is the need to examine both economies of scale and market structure in the context of market integration. Furthermore, the scale economies analysis should be as wide-ranging, sectorally, as possible and take into account the impact of technological change. The second is the necessity of having an overall analytical framework and one which would preferably provide a link between all the microeconomic effects and the macroeconomic ones.

Chapters 2 to 4 of this volume present work on the potential for cost reductions from economies of scale. Chapter 5 treats the question of both market structure and scale effects in the context of market integration by using a modified partial equilibrium approach. The sixth chapter examines the relationship between increased competition and innovation while the seventh is devoted to the characteristics of intra-industry trade in the Community.

The remaining chapters are of a slightly different nature. They present two quite separate through complementary approaches to the quantification of the potential benefits arising from completing the internal market. Chapter 8 deals with the microeconomic approach which has been developed using partial equilibrium techniques to measure the welfare gains from reducing or eliminating non-tariff barriers. Part of the microeconomic aggregation exercise (Annex A of European Economy no. 35, European Commission) has involved estimates of the economies of scale gains from restructuring. This work is presented in Chapter 9. Chapter 10 is devoted to a description of the simulations which have been undertaken using the Hermes and Interlink models, in order to interpret the findings of the microeconomic studies on internal market completion in terms of macroeconomic variables and their dynamic behaviour.

1.5

One of the difficulties throughout this work has been the need to obtain both quantitative and qualitative data at a relatively disaggregated level. The paucity of data in some cases has meant that geographical coverage is less widespread than would be desirable. In certain circumstances, therefore, some of these studies should be considered as illustrative rather than totally comprehensive, though attempts have been made to generalise the work. Though supervised by services of the Commission, these studies remain the responsibility of the respective authors.

CHAPTER 2

A Survey of the Economies of Scale

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Section 1. Introduction

This paper surveys estimates of the economies of scale and analyses the implications of these estimates for the completion of the EC.

Section 2 of the paper gives an outline definition of the economies of scale. Section 3 provides a brief description of the alternative methods of measuring the economies of scale. The conclusion to Section 3 is that engineering estimates are the most reliable estimates of scale economies. Section 4 describes the characteristics of industries which predispose them to being industries with large or moderate economies of scale. Engineering estimates of economies of scale are surveyed in Section 5. Engineering estimates are a reliable source for assessing the economies of scale for development and production costs. They are far less satisfactory for evaluating the economies of scale for multi-plant and multi-product firms. The economies of scale for firms are analysed in Section 6. Other evidence bearing on the magnitude of economies of scale is reviewed in Section 7.

The emphasis on, and the apparently rapid growth of employment in, small businesses in some countries in recent years conflicts with the perception of generally large economies of scale. This conflict is the subject of Section 8. In Section 9 the pattern of the Community's exports is related to the estimates of the economies of scale. The purpose of this analysis is to test whether the community's exports are concentrated on trades subject to large economies of scale.

Most of the material in the earlier sections focusses on manufacturing industries. The economies of scale for services are considered in Section 10. Finally the impact of the completion of the EC via the economies of scale is assessed in Section 11.

2.6

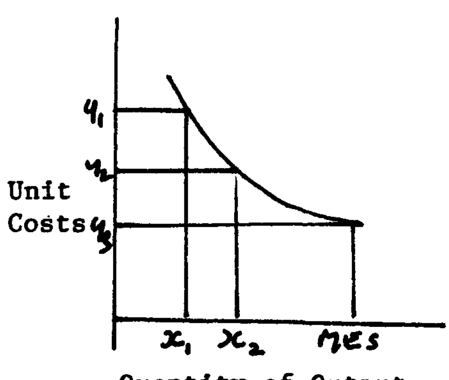
Section 2. Definition of the Economies of Scale

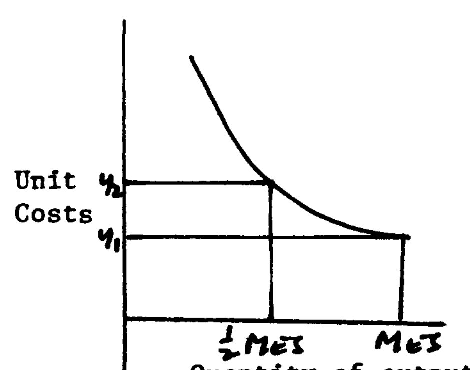
Definitions

Economies of scale (EOS) are reductions in average unit costs attributable to increases in the scale of output. Diagram 1 illustrates the point. As output increases from x_1 to x_2, unit costs fall from y_1 to y_2. The scale at which unit costs cease to fall is labelled the MES - the minimum efficient scale. In practice, the MES is usually defined in terms of the scale above which costs cease to fall rapidly, rather than the level at which they cease to fall at all.

In this paper the principal measure of the extent to which costs rise below the MES level is the percentage increase in costs at a half the MES. In diagram 1(b) this is $(y_2 - y_1)$ as a percentage of y_1. Again, in practice, costs are often divided between the bought out element of costs, materials, components and services bought from other firms, and internal costs including profits, or value added. This distinction is made because for some industries relatively few economies of scale relate to the bought out component of costs.

Diagram 2.1. (a) Costs and Output (b) Costs at Output below the MES





2.7

The Dimensions of Scale

In the literature economies of scale are most often associated with the scale or output of establishments (alternatively termed plants or factories) or the size of firms (companies). Cement is a relatively homogenous product and cement plants are often used to illustrate the economies of scale. Also many cement plants produce a single product, portland cement. Economies of scale for these plants apply to an output capacity of more than a million tons of cement a year.

In practice, at most plants a range of products is made and there are many, often inter-related, dimensions of scale to which economies of scale apply. Increases in the size of establishments or the overall size of firms per se are not necessarily the principal sources of economies of scale to be reaped from completion of the internal EC market.

The main dimensions of scale are:

a) Dimensions affecting the efficiency of production

1) The total output of particular products through time

2) the duration of production runs - the period during which a distinct product is made or produced before switching to the processing of another product.

3) The rate of production of particular products per unit of time (The size of batches is determined by the duration of production and the rate of production)

4) The extent of standardization of components and products.

5) The capacity of units of plant, machines and production lines within plants

6) The total capacity of individual plants

7) The overall size of a complex of plants at one site

8) The extent of vertical integration - the range of operations and stages of production performed at plants and by firms

b) Dimensions affecting selling and distribution costs

9) Sales to each customer

10) The geographic concentration of customers

11) The size of consignments to customers

c) Overall dimensions of scale

12) The size of firms

13) The scale of an industry

14) The scale of a national economy

Scale economies are reductions in unit costs attributable to different positions along dimensions of scale. In the same way that there are scale economies attributable to the size of plants, scale economies may relate to the size of batches, the size of firms or industries, etc. However a noteworthy distinction has been introduced into the literature. Where the production of two or more products reduces costs compared to the position where each product is produced separately in similar quantities, the economies are termed the economies of scope.

2.9

The Sources of Economies of Scale

The forces making for economies of scale are:

a) Indivisibilities

There are many costs which are at least partly independent of scale over certain ranges of output i.e. costs which are wholly or partly indivisible with respect to output. The following are examples:

Type of cost:	Partly or wholly indivisible with respect to:
The initial development and design costs for a new car	The output of the car
First copy costs of books, newspapers, etc.	The number of copies produced
Obtaining tenders and studying sources of supply for a component	The size of orders placed for the component
Items of capital equipment	The total output for which the equipment is required
Office records for a batch of a product	The size of the batch
Preparation of advertisements	The area of the country in which the advertisements are shown

As the relevant dimensions of scale are increased, indivisible costs can be spread over a larger throughput and the cost per unit is therefore reduced.

2.10

b) <u>The economies of increased dimensions</u>[1]

For many types of capital equipment both initial and operating costs increase less rapidly than capacity. A typical example of such economies occurs in the construction of tanks, pressure vessels and road and sea tankers which are used in the chemical and oil industries. If the thickness of the walls of a tank are not affected by its size, then the cost of increasing capacity increases approximately in proportion to the surface area, while the capacity of the tank rises in proportion to its cubic capacity. Another reason for large units being relatively less costly is that there are proportionately fewer parts to make and fabricate. Operating costs may also be affected by the size of units. In the processing industries the total direct labour costs of operating units of equipment are not much affected by their size, and maintenance costs are usually assumed to be proportional to the capital costs of equipment.

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(1) The economies of increased dimensions and the economies of specialisation which are considered in the following sub-section, may be considered as examples of indivisibilities. If labour and capital equipment were divisible in the same way, as say, a bucket of sand, then there would be no economies from these sources. Many types of equipment and labour are divisible in the sense that it is possible to build units with smaller capacity and employ less expensive labour, or to employ staff on a part-time basis, but the cost per unit of capacity may be higher because of the economies of increased dimensions and of specialisation, i.e. if the factors are purchased in small quantities, they may be less efficient. This distinction was made by E.H. Chamberlin in 'Proportionality, Divisibility and Economies of Scale'. Q. Jnl. of Econ., 1948.

One possible source of diseconomies for using larger units of capital equipment is that they may take longer to design, build and run in, particularly if the size is outside the manufacturer's existing experience. If large plants take longer to construct this will increase the cost of equipment because of the cost of capital tied up while the plant is built and run in.

c) The economies of specialisation

The larger the output of a product, plant or firm, the greater will be the opportunities for, and advantages of, specialisation of both the labour force and the capital equipment. Increased output may enable a firm to employ staff with special skills, or staff with more highly developed skills. Also it may be economic for firms with a large throughput to use special purpose machinery.

Increased output will provide greater opportunities for specialisation not only within a plant, but also for suppliers of materials and services bought out.

d) The economies of massed resources[(1)]

The operation of the law of large numbers may result in economies of massed resources. For example, a firm using several identical machines will have to stock proportionately fewer spare parts than a firm with only one machine, because the firm with several machines can assume that its machines are unlikely to develop the same faults at the

(1) If all factors of production and all products were infinitely divisible, there would be no economies of massed resources i.e. the economies of massed resources may also be regarded as a type of economy caused by indivisibilities.

same time. There may be similar economies for stocks of raw materials, and intermediate and final products, part of which may be held to meet interruptions to the supply of raw materials, a temporary breakdown of intermediate plants, and the uncertain flow of orders from customers. Similar economies for certain types of labour and monetary resources may be achieved by a large firm.

A large company's ability to spread risk may enable it to take greater risks. Large concerns have a greater opportunity for experimenting with new methods and introducing new products without jeopardising the future of the business if particular new methods or products are unsuccessful. Similarly if a firm operates in a number of national markets it can experiment with different policies in individual markets.

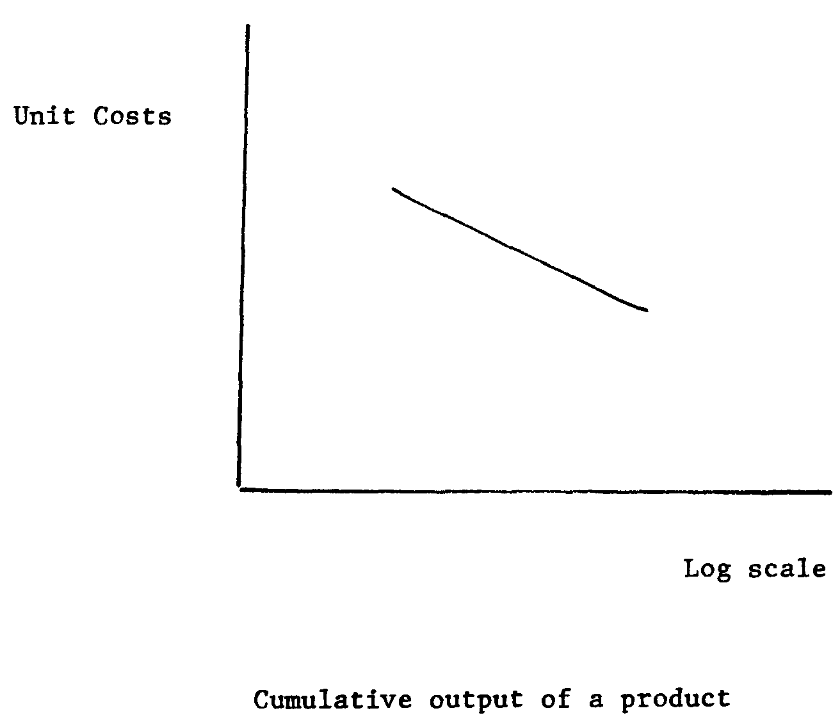
e) Superior techniques of organising production

Increased scale may make it possible to use more efficient techniques or methods of organising production; for example, as scale is increased automatic machinery may be used instead of manually operated machinery, or it may be possible to substitute methods of flow production for batch production. If high rates of output enable a firm to substitute flow for batch production, this usually results in a faster rate of production i.e. the time taken between work commencing on a product and its completion is reduced, and this should reduce unit costs for stocks and work in progress.

f) <u>The learning effect</u>

Learning is a source of economies which relates to movements along some dimensions of scale, particularly the cumulative output of products and the length of production runs. Diagram 2.2 illustrates the relationship. Unit costs are shown to decline as the cumulative output of a product increases. In theory the effects of learning (or experience) can be divided between the invention and introduction of new techniques - technical progress - during a production run, and the other cost-reducing effects of sustained production of a good. Examples of the latter are greater manual dexterity brought about by experience of production and machining successive batches of components more exactly as experience of assembly is obtained.

Diagram 2.2 <u>The Learning Curve</u>



g) Economies through control of markets

A vertically integrated concern may be able to achieve economies by evening out the flow of output. If the operation of two consecutive processes required to produce a product are under independent ownership, a conflict of interest may arise and result in fluctuating output. For example, an independent retailer when reducing his stocks will not take into account the losses to be incurred by a manufacturer due to lost production. The price system, operating through reductions in prices by manufacturers at times of slack capacity, may not counter this tendency because retailers may assume that the slackness of demand on manufacturers will continue for some time, and that prices will fall still further, and so price cuts may not stimulate orders.

Control of a market by a manufacturer may reduce the uncertainty he faces - he will know that customers cannot switch their custom to competitors - and so enable him to invest more heavily in capital intensive methods of production. The possible economies a firm can achieve through the control of its markets which have been outlined so far are advantages attributable to a monopoly situation - the supplier controls the customer. Also they only occur because there are changes through time in market conditions.

Apart from the scale economies which may be achieved by vertical expansion there are also other economies - such as reductions in buying and selling costs, reduced need for checking the quality of consignments and control of the timing of deliveries and quality - which are attributable to the control of suppliers.

This completes the outline of the sources of economies of scale. We now turn to the sources of diseconomies of scale.

2.15

The Sources of Diseconomies of Scale

Increases in unit costs may occur as scale increases for two groups of reasons:

(a) The supply of a factor of production is fixed or the cost of a factor increases as demand for the factor rises.

Examples of factor limitations are:

(i) the labour supply in an area available to a firm

(ii) the space available at one site for a factory

(iii) the supply of water which can be taken from a river for purposes of cooling a plant

(iv) the supply of a material produced as a by-product of another process

(v) the size of ship which can dock at a port.

(b) The efficiency in use of a factor of production declines as the quantity of the factor of production used by a firm increases.

The first source of increases in costs caused by the supply of factors of production being fixed or the costs of factors increasing as demand rises is not a source of diseconomies of scale. For the purpose of measuring the economies of scale, it is assumed that there is a perfectly elastic supply of factors of production available to firms - the quantity of factors they buy does not affect the price. In practice factor costs may rise with increasing scale and offset the economies of scale.

The efficiency in use of factors of production may decline with increases in scale for the following reasons:

2.16

(a) Technical forces

There are some technical forces which cause diseconomies of scale. As the capacity of individual units of plant is increased, increased stresses and strains[1] and friction may result, and to combat these, wider gauge walls etc., may have to be used, different, and more expensive materials employed, cooling systems, or improved cooling systems be introduced, or more elaborate foundations may have to be built. It is usually technically possible to overcome the problems caused by increasing stresses and strains etc., in large plants, but in certain cases, and over certain ranges of capacity, the costs of overcoming them increase faster than the increase in scale. There are in practice two types of costs required to overcome these problems - it may be necessary to use more expensive (and stronger) materials etc. and/or there may be initial costs required to invent new techniques to overcome the technical limitations when the first of a larger scale of plant is built. A way of avoiding any net diseconomies because of increased stresses and strains in many cases is to duplicate units of plant. Thus stresses, etc. are a limitation on the sources of economies of scale rather than a source of diseconomies.

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(1) An example of stresses and strains increasing more than proportionately over a range of output is provided by turbines. If very large turbines are built the ends of the blades travel at a speed near to that of sound. At this speed the strains and stresses increase more than proportionately with the capacity of the turbines.

(b) Management

It has been argued that the costs of management may increase more than proportionately with scale or the effectiveness of management may decline as scale is increased. If so, this could set a limit to the optimum scale for plants and firms(1). Given a changing environment, and evolving firms, as scale increases, the costs of coordinating and organising production may rise more than proportionately. The effectiveness of management may decline as the chain of management is extended because of delays in taking decisions brought about by the length of the management chain and/or the tendency for those ultimately taking decisions to get out of touch with events affecting the decisions. Scale may also affect the motivation of managers. Whether or not the management and ownership of a large firm are separated, the determination to maximise profits at the expense of other objectives may decline as scale is increased. Within a large organisation it may be difficult to focus financial incentives as accurately as in a small concern. In some cases the management of large firms may be able to shelter behind the technical economies of scale achieved by their firms. Small firms may face the choice between economising and achieving a higher level of efficiency, or being forced out of business and this may spur the managers to achieve relatively greater efficiency and to avoid mistakes(2).

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(1) If the effectiveness of management falls as scale is increased, the costs of production are increased, but not necessarily the cost of management itself.

(2) Small firms may operate nearer to the bounds of their production possibility surface (p.p.s.). For a discussion of X-efficiency (the degree to which firms operate within the bounds of their p.p.s.) see Harvey Leibenstein, Am. Econ. Rv. LVI (June, 1966) and Q. Jnl of Econ. (Nov. 1969).

On the other hand a large firm can employ more management specialists, and increasing scale may result in a less than proportionate demand for decision taking and management expertise. For example the problems of managing some types of large plant may not increase proportionately because of the economies of scale for direct labour costs.

(c) Labour relations

As scale is increased people may simply work less well. The possibility that the performance of employees declines with scale could apply to more than one dimension of scale. As the length of production runs increases this may result in specialized and/or repetitive work, as the size of factories is increased it may be difficult to retain a 'family spirit', and similarly in a large firm labour relations may be inherently worse. The larger the factory or firm the greater the hierarchical chain must be - employees tend to be further away from the 'boss', and he is less likely to understand them. Also it may be easier for the employees of a large firm, or at a large factory, to oppose the management and to organise restrictive practices. This could be because the management of a small firm can spot sooner, and remove, employees who might create diversions, or because in a large organisation it is easier to whip up feelings in the same way that it is easier to whip up mass hysteria at a football match watched by a great many spectators, compared to a match watched by very few spectators, or simply because a large organisation breeds more dissatisfaction.

In order to minimise the problems of managing large organisations and of labour relations, companies have adopted strategies of focussing their activities, of selling off peripheral lines of business, and of delegating responsibility to the managers of separate subsidiary companies and profit centres.

(d) Selling and distribution

Selling and distribution costs are possible sources of increased costs at higher scales of output. For example, if, as the scale of a plant is increased, the geographic spread of markets, and so the average length of haul, is increased, the average unit costs of transport will rise. If the additional sales are obtained from a new, less concentrated, market, the costs per unit of representation may be increased. On the other hand if the additional sales are made to existing customers and the size of consignments are increased, both selling and delivery costs per unit may be reduced. Whether there are increased unit costs at higher scales of output depends on which marketing dimensions of scale are increased.

Technical Progress

The inter-relationships between economies of scale and technical progress are important.

a) Development and other initial costs may, or may not, involve technical progress. Spreading these costs over the output to which they relate is often an important source of reductions in unit costs with increases in scale. In practice, it is not always possible to distinguish development costs which produce, or require, new knowledge or techniques and those which do not.

b) As noted above learning effects may include the invention and introduction of new techniques - technical progress.

c) In order to build plants with larger capacity than at present operated, it may be necessary to invent and use new techniques. It may not be technically possible to simply increase the dimensions of a plant or machine.

d) Firms have to adapt to changes in the techniques of production through time, and it is sometimes claimed that large firms have advantages in achieving and introducing technical progress.

Many but not all of the 'engineering' estimates of scale effects given in Section 5 of the paper include the effects of spreading development and other initial costs for products over varying outputs of the products, and the effects of learning for production runs of varying length. Some of the estimates therefore include an element of technical progress. The advantage of including development costs in analyses of the economies of scale is that it makes them more realistic. Firms in many industries have to develop a stream of new and improved products to remain competitive and development costs are a substantial proportion of total costs for many firms. But problems are introduced when development expenditure is included. The costs of developing many new products depends in part on the expected demand for the product, and a firm's expenditure on developing new products depends upon the development strategies adopted by its competitors. In an oligopolistic market if one firm introduces new products, its competitors may follow this lead and introduce similar new products.

The Economies of Rapid Growth

The concept of economies of scale for cement plants which was used earlier as an example is static, it measures differences in unit costs for positions along the dimension of scale measuring the sizes of plants. The estimates of costs and economies of scale are for plants built at one point in time or more realistically are estimates made for hypothetical plants for which blueprints are designed at one point in time. The important point is that the plants are designed to minimise costs for their scales of production and are based on the set of techniques of production known at one point in time. Otherwise unit costs for the plants would differ because of changes in technical knowledge through time as well as scale differences. When movements along some dimensions of scale, such as the cumulative output of products, are considered, the estimates of economies of scale can not relate to one point in time, though they can be based on a constant set of techniques.

A related concept is the economies related to rapid growth. In practice there are a number of forces (apart from the utilization of spare capacity) which may enable a firm which increases its output rapidly to achieve lower costs than a firm which expands less rapidly.

(1) There may be disequilibrium between the capacity for different operations - existing resources may not be in perfect balance - and by bottle-neck breaking it may be possible to achieve some increase in overall capacity without a proportionate increase in costs. The disequilibrium may occur because of indivisibilities, errors when the original plant was built or extended, the original plant was designed with the expectation that it would be expanded later, differential rates

of learning or technical progress for different operations, the freeing of resources, particularly management resources, engaged in previous expansion, etc. The rate of growth of output will determine the extent to which a firm takes up these economies in a given period.

(2) There may be scope for taking advantage of the economies of scale, by, for example, spreading first copy costs for a periodical over a larger circulation, by building larger units of plant, and by extending existing plants. The rate of growth is a factor determining the total output of products through time, and hence the extent to which the economies for spreading initial costs are achieved. It is also an important influence on the size of new plants and extensions to existing plants.

(3) New techniques which were not available, or were not used, when existing plants were built may be incorporated in new capacity: growth may enable a firm to take advantage of technical progress. The rate of growth of a firm may affect, or depend upon, technical progress. For example, a firm which is expanding rapidly may have more incentive to invest in developing new techniques of production which it can incorporate in its new capacity.

The following are the main sources of increased unit costs and diseconomies of rapid growth.

(1) Existing capacity will have been built when price levels were lower, and, other things being equal, in book value terms, but not in real terms, capital costs will be lower than for new plants. Also, in practice, much of the capital equipment employed in old plants will have been written off against previous profits and capital costs may be low. The rate of growth will determine the proportion of 'high cost' new plant operated by a firm.

(2) The costs per unit of some factors may increase if scale is increased. Examples of limitations on the supply of factors were given above.

(3) Growth may result in firms reaching levels of output where technical diseconomies of scale operate.

(4) Marketing and distribution costs per unit of output may have to be increased to dispose of a larger output.

(5) Rapid growth may influence the costs and effectiveness of management and labour relations favourably or otherwise. For example rapid rates of growth may enable a firm to maintain a balanced, or younger labour force, alternatively it may result in a dilution of a skilled and loyal labour force.

Avoiding the Disadvantages of Small Scale

It is possible to avoid some of the disadvantages of operating on a small scale. For example, a firm may buy out production operations or components for which there are large scale economies from domestic suppliers or suppliers in other countries. If these suppliers produce on a large scale or have low costs for other reasons, such as lower wages in other countries, then the firm may be able to buy at prices which are competitive with the costs of larger scale rivals.

The scope for avoiding the disadvantages of small scale apply particularly to research, development, marketing and distribution. Small firms may adopt strategies which enable them to compete. One marketing strategy is to produce for niche markets requiring distinct products for which there are few potential economies of scope for production if they were made with other products. Similarly a small firm may avoid a marketing and distribution handicap by adopting a strategy of selling own-label products to a supermarket or chain store groups which market and distribute the products. Similarly there may be scope for a firm with smaller output than its rivals to concentrate on products which do not require research and development expenditure, or to buy in research and development from a firm operating in another country.

Efficiency

This discussion of the sources of economies and diseconomies of scale and growth would be incomplete without a brief reference to the other forces affecting the success of a business. Most important is the ability of management to ensure efficient operation and to move with the times. More specifically in many industries the ability of management to control the quality of products and rejection rates, to organise production efficiently within the limits set by the size of plant and firm, to develop and introduce new or improved products, to search for profitable investment opportunities, to maintain a high level of capacity utilisation, etc. are very important to the success of a business. Firms which are so large that they control their markets may use their monopoly position to go peacefully to sleep, and efficient firms of less than optimum size may be absolutely more efficient than sleepy firms of a technically optimum size.

Section 3. Methods of Estimating Economies of Scale

Comparisons of costs

If experiments could be conducted to measure economic variables then to measure the economies of scale for plants in an industry, plants of varying size would be constructed and operated. Each plant would be built to incorporate the most efficient techniques for its scale of production. Unit costs of production for each plant would be measured and the economies of scale estimated by comparing unit costs for the plants.

It is, of course, impractical to build plants merely to measure the economies of scale. One alternative is to obtain costs of production for existing plants which operate at varying scales of output. Apart from the difficulties of obtaining such data, the main qualifications to this approach are that the data usually relate to plants built at different points in time. The plant and equipment is of varying vintages and the latest plant and equipment may incorporate knowledge which was not available when the earlier units were built. Also the plants may not be fully adapted to the scale of production at which they operate. Inevitably cost data for actual plants relate to operations in existence and cannot provide estimates for scales of production outside that range. For some industries cost data for a great many actual plants is available and have been analysed to isolate each of the factors influencing costs and to estimate the economies of scale. Electricity generation is the industry most fully researched for this purpose.

Another source of information about economies of scale is the costs of expanding the capacity of plants. Certainly experience of expanding capacity provides insights to the economies of scale, but straight comparisons of costs pre- and post-expansion do not give estimates of scale economies. These comparisons are affected by the extent to which existing plant was written down, technical progress, the extent to which the original and new capacity plant were adapted to their scales of production, as well as economies of scale.

Census data

Censuses of Production contain data on costs for large numbers of plants and firms. The clear advantages of these data are that they cover a great many establishments, again they are actual costs, and they are collected on a standardised basis.

The main limitations on estimating the economies of scale from Census data are that the definition of most Census 'trades' includes the production of a range of products for which economies of scale, market size and growth vary, and affect the size of establishments. For example, one U.K. Census trade includes the production of components for vehicles such as seat belts as well as engines and the assembly of cars, commercial vehicles, buses and battery driven vehicles. Some components for cars can be manufactured very efficiently in a factory of very small absolute size, but for the assembly of standard cars substantial economies of scale extend to an output of at least a quarter of a million cars a year on one site. Similarly production of most agricultural equipment is lumped together in one Census 'trade', and there are wide differences in the complexity and hence economies of scale for different types of agricultural equipment. These trades are not exceptional. The Index to the Standard Industrial Classification[1]

(1) HMSO 1981.

lists many products and processes for each three digit SIC heading. The number of products shown for each of 104 three digit headings was summed and the headings reordered in terms of the number of products and processes listed against them. For the median heading, the number of products and processes distinguished was 38, for the lower quartile 22, and for the upper quartile 75.

Comparisons of Census data for establishments of varying size does not provide unqualified estimates of the economies of scale because plants of different sizes make different products. Another limitation on Census data is that they can be used to derive estimates of the economies of scale for only one or possibly two dimensions of scale - the size of establishments and possibly the size of firms.

Time series data

Another source of cost data for estimating the economies of scale is time series data of costs and prices for products, plants, firms or industries. These data can be related to volumes of output, to trace the reduction in unit costs through time, as output increases. The principal and important qualification to this method is to distinguish the effects of those improvements in technology and efficiency which occur through time and which are independent of scale from the effects of increasing scale. Improvements in technology may involve the introduction of more efficient techniques which were not used previously or the introduction of newly developed methods of production. It is technically very difficult to isolate the effects of technical change and increases in scale.

Engineering Estimates

Another approach to estimating the economies of scale is to assemble estimates from managers, engineers, economists and accountants of the cost of operating at different scales of production, where full adaptation to the scale of production is allowed for. This is the method on which most reliance is placed in this paper and so this method is described in more detail.

In order to make engineering estimates the methods of production have to be broken down into individual processes and operations, and the technical basis for economies of scale has to be investigated. Usually it is not possible to describe processes in terms of engineering production functions which are based on scientific laws or experimental data, and so the estimates of the economies of scale for machines, process units, and operations, are based on engineers', cost accountants' and managers' estimates of costs. Their estimates are based on operating experience for plants of varying size, the experience of planning and building new plants and expanding plant capacity and general experience of their industry. Estimates of the components of costs, capital and operating costs for individual items of equipment of varying size, costs for processes and/or for groups of processes, development, first copy or initial costs for products, etc. are assembled for each industry, and are used to estimate the relationships between unit costs and the various dimensions of scale. The reliability of the estimates depends upon the experience of those making the estimates. Managers familiar with the construction and operation of giant steel works in Japan or cigarette factories in the USA are in a strong position to make estimates for those sizes of plant.

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The weakness of 'engineering' estimates of the type described are that they are subject to a margin of error and that they lack rigour. Their accuracy is particularly suspect when dealing with some of the non-technical forces determining the effects of scale, for example, when estimating the relationship between size and the quality and effectiveness of management, and the effect of scale on the development of new techniques and products.

The main advantage of the engineering approach is that it is possible to hold other conditions, such as the state of the arts, the quality of factors of production, their relative prices, and some dimensions of scale, constant when making estimates of the economies of scale.(1) In spite of the limitations of the engineering approach it has been used in this paper because it is the most satisfactory method of making estimates of the economies of scale.

The best of the 'engineering' estimates are based on technical relationships and detailed costings. Such estimates are related to the production of specific ranges of products. The main qualifications to these 'engineering' estimates are that they are estimates for hypothetical operations. In practice, costs may vary from expected levels and such variances could be related to scale. Where 'engineering' estimates extend beyond scales for which experience has been obtained, unforeseen technical and management problems could invalidate the estimates. Transport costs and market constraints are usually excluded from engineering estimates. Transport costs can be

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(1) Plainly the quality of factors of production does vary. For example, the number and quality of apprentice trained craftsmen is greater in Germany than the UK and this difference contributes to differences in labour productivity and the performance of firms in the two countries. But it is separate from the economies of scale.

included, but they have to be related to an actual or hypothetical distribution of markets.

The Survivor Technique

The qualifications to estimates of the economies of scale based on costs have been described. Stigler suggested a method of avoiding these difficulties(1). The survivor technique is based on the reasonable assumption that if there is a most efficient scale of production for an industry then plants of that scale of production will gain an increasing share of an industry's output. A number of attempts have been made to apply the survivor technique to census data. If at successive censuses a size class of establishments gains an increasing share of a trade's output, it is claimed that size range is the optimum scale for the trade. The advantage of the technique is that the effects of all the forces which determine the success of a business are tested. These forces include the effectiveness of management and the ability of a business to adapt to changes in technology and the state of business.

Again the principal problem involved in applying the survivor technique to data for census trades is that each trade covers a wide range of activities for which the optimum scale and the state of business varies.

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(1) C.J. Stigler, 'Economies of Scale', Jnl. of Law and Economics, 1958.

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Sources of Estimates

Table 3.1 lists some of the principal sources of estimates of the economies of scale for a range of manufacturing industries[1]. Table 3.2 summarises the advantages and disadvantages of the methods of measuring the economies of scale.

Conclusions

There are qualifications to all the methods of estimating the MES and the economies of scale. In practice the only sources of estimates of scale gradients for many industries available for use in this paper were engineering estimates and estimates based on census data. In this paper we concentrate on the engineering estimates. Estimates of the MES and scale gradients based on census data were not used as a principal source of estimates. The main reason for this decision was the author's view that the main dimension of scale to which economies of scale relate is the output of products and closely related products at plants and by firms. Censuses provide no indicators of costs relative to the output of products.[2] Engineering estimates are described in Section 5. Estimates made by other methods are included in section 7 where other evidence of the economies of scale is reviewed to assess whether it confirms or conflicts with the engineering estimates.

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(1) Studies of economies of scale for a single industry and for industries apart from manufacturing industries have been excluded from Table 3.1.

(2) There is no justification for assuming that the number of products made at each establishment in a trade is fixed and that the output or size of each establishment indicates the scale of output of the products made there.

Table 3.1 <u>The Principal Sources and Reviews of Estimates of the Economies of Scale for Manufacturing Industries.</u>

Method of Measurement	Source of data	The Studies	Main Country of Application
Cost Comparisons	Data for actual operations	Caleb Smith, 'Survey of Empirical Evidence on the Economies of Scale' in 'Business Concentration and Price Policy', G.J. Stigler and others, NBER, 1955.	USA
		J. Johnston, 'Statistical Cost Analysis', New York and London, 1960.	UK
		A.A. Walters, 'Production and Cost Functions: An Econometric Survey' in Econometrica, Vol. 31, 1963.	International
		Nicholas Owen 'Economies of Scale, Competitiveness, and Trade Patterns within the European Community', Oxford, 1983.	European countries
	Census data	Z. Griliches and V. Ringsjad 'Economies of Scale and the Form of the Production Function'. Amsterdam, 1971.	Norway
		J.R. Baldwin and P.K. Gorecki 'The Role of Scale in Canada-US Productivity Differences in the Manufacturing Sector', Toronto, 1986.	Canada
	Engineering Estimates Industry Studies	J.S. Bain 'Barriers to New Competition' Cambridge, Mass., 1956.	USA
		J. Haldi and D. Whitcomb, 'Economies of Scale in Industrial Plants', Jnl. of Political Economy, Vol. 75, 1967.	USA
		C.F. Pratten 'Economies of Scale in Manufacturing Industry', CUP 1971.	UK
		F.M. Scherer, 'The Economies of Multi-plant Operation' Cambridge, Mass. 1975	USA
		L.W. Weiss 'Optimal Plant Size and the Extent of Suboptimal Capacity' in 'Essays on Industrial Organization in Honor of Joe S. Bain' ed. by R.T. Masson and P. David Qualls, Cambridge Mass., 1976.	USA
Survivor Technique	Census Data	T.R. Saving, 'Estimation of the Optimum Size of Plant by the Survivor Technique' Quarterly Jnl. of Econ. 1961.	USA
		W.G. Shepherd, 'What does the Survivor Technique Show about the Economies of Scale' Southern Econ. Jnl. 1967.	USA

Method of Measurement	Source of data	The Studies	Main Country of Application
		R.D. Rees, 'Optimal Plant Size in United Kingdom Industries: Some Survivor Estimates' Economica, Nov. 1973	UK
		M. Pickford 'Estimating Economies of Plant Scale in New Zealand Manufacturing Industries Using Census Data', New Zealand Economic Papers, 1984.	NZ

Table 3.2 Advantages and Disadvantages of Methods of Measuring the Economies of Scale

	Provides measures of		Estimates available for many manufacturing industries	Dimensions of Scale for which estimates available:				Rigour of Estimates	
	the MES	Scale gradients		Production runs	Products	Plants	Firms	The estimates can be tested by conventional statistical tests	The estimates reflect management costs and effectiveness and response to change
Cost Comparisons:									
Data for actual operations	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Census data	Yes	Yes	Yes (but only for a few countries)	No	No	Yes (but the plants make different products invalidating the comparisons)	Generally No	Yes	Yes
Engineering estimates	Yes	Yes	Yes	Yes	Yes	Yes	Yes (but the estimates are not reliable)	No	No
Survivor technique	Yes	No	Yes	No	No	Yes	Generally No	No	Yes

Section 4. Characteristics of Industries and the Economies of Scale

Most businessmen claim that their industry is different from others. There is some justification for these claims, nevertheless industries can be grouped according to various characteristics. In this section some characteristics of industries and their relationships to the economies of scale are considered.

PRODUCTION CHARACTERISTICS

Costs of developing products

Drugs, aircraft and cars are products which involve considerable expenditure for development and testing. Spreading these costs over the output of products to which they relate provides significant economies of scale.

Paradoxically completely new types products also provide opportunities for small and new firms. Where the market for a radically new product is small initially and the costs of development are limited, small firms may be able to grow with the market for the product.

Complexity of products

Aircraft, cars and lorries are products for which there are large economies of scale. One explanation is the complexity of these products, they are made up of many distinct parts. Also many of the parts have to be made very accurately. Complexity affects design, development and production costs.

Similarly where a series of complex manufacturing operations are required to produce products as in oil refining, there will tend to be large economies of scale. Where production processes are simple as for the production of many items of food, the economies of scale for production are smaller.

Standardised products

Industries producing standardised products such as cement tend to be organised in large units. Standard products facilitate large scale production. Although computer control of stocks and production aids manufacture of a variety of products, the scope for economies for joint production depends upon the degree of variation between products. Industries such as paint and footwear which produce a very wide range of products in terms of colours, sizes, fashions, quality and price provide opportunities for small firms and establishments.

An interesting contrast is between the motor and computer industries. The latter provides greater opportunities for small and new firms to enter. The rapid evolution of computer technology has enabled firms to set up and grow with new segments of the market. Another explanation is that a higher proportion of the costs of a car relate to the components which do not vary for special uses or to provide product variety. For many computer systems much of the software and some of the hardware relate to special applications. Much of the hardware can be bought off the shelf.

Units produced

Production of a very large number of units of a product is associated with less significant economies of scale. The tobacco industry produces billions of cigarettes and the scale curve for tobacco factories of the size in existence is shallow.

Size of products

Bulky products such as large ships and process plant have to be built on a one off basis and this limits the scope for scale economies, though there are economies for producing a series of a type of ship or design of process plant through spreading the costs of design and learning from experience.

Processes of production

Some processes are generally associated with large scale economies of scale in relation to the output of products, and others do not lend themselves to large scale operation.

a) Processes associated with large economies of scale for the output of products:

   1. Continuous process operations as in oil refining.
   2. Rolling operations as in the metal manufacturing, pulp, paper and printing industries.
   3. Stamping and forging.
   4. Machining metal.
   5. Processing in vessels as in the paint and dyes industries.

b) Processes associated with smaller economies of scale:

   1. Casting and moulding(1)
   2. Extrusion
   3. Spinning

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(1) Spreading the costs of moulds over large outputs of a product is a significant source of economies for some applications.

4. Weaving

5. Sewing

6. Assembly

MARKETS

Markets are segmented by the costs of transport which increase with the distance of deliveries, tariffs, legal and language differences, and differences of taste. One approach to estimating the economies of scale is to ignore selling, marketing and distribution costs and focus on the costs of production. This procedure is deceptive because there are economies of scale for marketing and distribution related to a firm's share of a market. For example, advertising by a firm with many customers in an area will result in many messages per advert getting to customers, and unit delivery costs will be less for a firm with large sales in an area, compared with a firm with fewer more scattered sales. An alternative approach is to relate the costs of selling and distribution to an actual or hypothetical pattern of markets and channels of distribution, and estimate the costs of marketing and distribution for firms with different shares of a market.

Distribution costs are important for explaining the actual size of plants in many industries. Other things being equal, the larger the output of a plant the greater will be unit delivery costs. Higher delivery costs may offset the lower costs for large plants compared to costs for a series of plants sited to minimise transport costs. Even for industries in which modern methods of bulk transport have reduced delivery costs, it may not be economic to close existing small plants which serve local markets, and concentrate production. The capital costs of plant and equipment for the small plants will have been written down and the plant may have a low second hand value. The reduction in the costs of production may be more than offset by the increased costs of transport.

The Size of National Markets

In smaller countries, such as Norway and New Zealand, the average size plants is smaller than in the large industrial countries. One explanation is, of course, transport costs and tariffs, but there are more complex reasons for the differences. After barriers to trade are reduced, there will be a legacy of small production units which will persist for many years. Often new small plants would not be set up where existing small plants can compete because the costs of developing products have been incurred and much of their capital equipment has been written off. Easy access and close proximity to a large market provides firms with advantages for developing products and marketing. Firms in relatively small countries may circumvent their small domestic market by exporting, and protecting their position in foreign markets by investment. They may also tend to specialise in producing intermediate goods for sale to other firms to avoid a marketing disadvantage, and make and export goods for which the economies of scale are modest to avoid being at a disadvantage for production costs. Such specialisation can be self-reinforcing. Managers and other employees in smaller countries are experienced and efficient at operating smaller scale units.

Section 5. A Survey of Engineering Estimates of the Economies of Scale

Introduction

Engineering estimates of the economies of scale are based on estimates of the unit costs of operating at different scales of production. In brief the assumptions made when estimating unit costs and the relationship between scale and costs are:

1. The estimates are for hypothetical production runs, plants and firms where the production facilities, manning etc., are adapted to the scale of output so as to minimise costs at that scale.

2. Relative prices of factors of production are those ruling in the countries for which the estimates were made, generally the USA or European countries.

3. The technologies available are those used in the developed industrial countries.

4. The degree of vertical integration is fixed.

There are problems involved in presenting a summary of engineering estimates of the economies of scale. There is a great deal of information to be summarised, the information is not comprehensive, either for all trades, or for all the dimensions of scale for the trades for which information is available, and the assumptions and definitions used by authors who have made the engineering estimates of the economies of scale are not identical.

Table 5.1 summaries the relatively thorough estimates of the economies of scale. The next step was to extend the estimates to some trades for which engineering estimates were not available. This exercise is reported in Table 5.2. In table 5.3 the information available is used to draw conclusions about the economies of scale for industry groups. Tables 5.4 to 5.8 summarise the quantitative estimates of the economies of scale for the main dimensions of scale.

Introduction to Table 5.1

Table 5.1 lists 'engineering' estimates of the economies of scale in NACE3 order. Only the salient sources and figures are given in this survey. For those industries for which a number of studies have been made only the more recent studies are included. The first four columns of Table 5.1 list the NACE3 references, the industries, the sources of the estimates of the economies of scale and the countries from which information was collected to make the estimates. The next two columns summarise the quantitative estimates. The fifth column lists the estimates of the minimum efficient scale (MES) which is defined below. This column gives the dimensions of scale to which quantitative estimates of the MES relate, and the MES scale for each of the dimensions of scale listed. The sixth column gives the increase in unit costs below the MES scale, usually this is given in terms of the increase in unit costs at a half or, one third of the MES scale. The seventh column lists the main dimensions of scale to which economies relate and indicates the extent of the economies. This column includes dimensions of scale for which no quantitative estimates of the MES are available.

Definition of the MES

The information for Table 5.1 is drawn from a number of sources and the definitions used by authors of the sources were not uniform. One problem is the definition of the MES. In practice most engineering

Table 5.1 Survey of the Engineering Estimates of the Economies of Scale.

NACE3 NUMBER	Industry	Source	Countries for which estimates made	M.E.S. Dimension of Scale - MES Scale for that dimension	Increase in unit costs below MES Scale	Main dimensions of scale to which economies relate	Comments	Size of the Industry Percentage of Employment in UK Manufacturing Industry in 1985	Representativeness of the estimates for UK industry
14	Mineral Oil Refining	Scherer 1975[1]	International	Size of refineries - 200,00 barrels a day Oil companies - 2-3 plants, say, ½ m. barrels a day	4% at 1/3rd MES Slight disadvantage with one plant	Size of refineries - moderate. R & D - slight.		0.3 (Oil refining is a highly capital intensive industry)	Major oil refineries account for more than half the net output of the industry. There is a fringe of median and small plants reprocessing oil and making specialist products. Technical economies of scale also apply to these operations, but markets are small and/or processing costs low for some of them.
22	Production & Preliminary Processing of Metals							3.2	
221	Iron and Steel Industry							1.3	
	Steel (Crude Steel) Integrated Plants	Scherer 1975[1]	International	Size of plant - 4m. tons a year	11.0% at 1/3rd MES Production runs - some benefits. Products - some benefits. R & D - slight.	Size of plant - substantial.	Depending upon the price of scrap relative to other raw materials, mini plants using scrap can be competitive.	0.8 (estimate)	The estimates showing large economies of scale (the slope of the scale gradient) is representative. Crude steel production forms about half the output of the industry. The MES for some finishing works and special steel works is lower in terms of tonnage of output, but large economies of scale apply for these operations.
				Steel companies 1 plant	Very slight advantage for multi-plant operation	Size of company - a less important factor			
		Cockerill 1984[3]	International	Size of plant making flat rolled products 10m tons a year	No estimate		The scope for scale economies are slightly less for other types of products.		
				Steel companies Economies may extend beyond 10m. tons a year	No estimate				
		Muller et al. 1985[17]	Germany	Integrated steelworks 9.6-17m tons a year Mini steelworks 0.7-0.8m tons a year	> 10% at 1/3rd MES > 10% at 1/3rd MES				
	(Special steels)	Pratten 1971[4]	UK	Groups of products such as stainless steel and tool steels - 100% of UK output	No estimate but significant		In terms of value added there are substantial economies of scale		
223	Drawing, Cold Rolling etc. of Steel							0.5	There are a great many establishments in this industry making different products. For some simple products like barbed wire the economies of scale are rather limited for others like wire netting there are moderate economies.
	Steel Wire Fencing	UK Monopolies & Mergers Commission Report 1987	UK	Factories Barbed wire - sales of £ 7m. a year. Wire netting - sales of £6m. a year in 1986	No estimate No estimate			0.04 (estimate)	

NACE3 NUMBER	Industry	Source	Countries for which estimates made	M.E.S. Dimension of Scale - MES Scale for that dimension	Increase in unit costs below MES Scale	Main dimensions of scale to which economies relate	Comments	Size of the Industry Percentage of Employment In UK Manufacturing Industry in 1985	Representativeness of the estimates for UK industry
224 2245	Non Ferrous Metals Industry Primary and Secondary Aluminium							1.0	Aluminium processing is probably representative. There are significant economies for large outputs of products and production runs. The MES varies according to the process used and the market often limits the scale of production in practice.
	Aluminium Semi-manufactures	L. Wagner 1981[2] reference to U.K. National Board for Prices & Incomes Report No. 39 'Costs & Prices for Aluminium semi-manufactures 1967	UK	Works making rolled products - 200,000 tons per annum.		Size of works - no estimate. Production runs - significant. Products - significant. R & D - significant.	Scale economies much smaller for works making extruded products.	<0.1 (estimate)	
241	Manufacture of Clay Products for Construction Purposes							0.4	The estimates for non-fletton bricks are representative for much of the industry, but economies of scale for flettons are greater. Also there are niches where small establishments can compete; for example making bricks which match bricks used in existing buildings and which are no longer made on a large scale.
	Bricks	Pratten 1971[4]	UK	Non-fletton brickworks - 25m bricks at least.	25% at half MES	Size of works - substantial.	The MES for fletton brickworks is higher.		
				Size of company manufacturing non-flettons	Slight if any advantages for multi-works firms.				
242	Manufacture of Concrete or Plaster Products for Construction							0.2	Cement production forms a large part of this industry (more than half), but there are a lot of small establishments presumably making other products or distributing cement.
	Cement	Scherer 1975[1]	International	Cement works 1.3m tons a year	26% at 1/3rd MES	Size of works - substantial.			
		Muller et al 1985[17]	Germany	Cement works 1.3m tons a year	> 10% at 1/3rd MES				
243	Building Products of Concrete, Cement or Plaster							0.7	Plasterboard is not typical for this industry which includes ready mixed concrete and concrete products which are costly to transport and are made at many sites to minimise transport costs.
	Plasterboard	L. Wagner 1981[2] reference to Monopolies & Mergers Commission Report on Plasterboard 1974	UK	Works 18-20m sq. mtrs. a year				0.1(estimate)	
247	Manufacture of glass and glassware							0.8	Glass bottles are not typical for this industry. It includes flat glass for which there are large economies of scale and ornamental and scientific glassware for which there may be large economies for some products but for many of these products markets are so limited that small establishments are competitive.
	Glass Bottles	Scherer 1975[1] UK Monopolies and Mergers Commission Report on 'The proposed merger of Rockware, United Glass & Reform National Glass', 1975 and author's knowledge of the industry	International	Factories 133,000 tons a year or 1000 employees	11% at 1/3rd MES	Size of works - moderate. Production runs and Products - some benefits.	There are scale economies for large outputs of specialised products e.g. pharmaceutical bottles.	0.1 (estimate)	

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NACE3 NUMBER	Industry	Source	Countries for which estimates made	M.E.S. Dimension of Scale - MES Scale for that dimension	Increase in unit costs below MES Scale	Main dimensions of scale to which economies relate	Comments	Size of the Industry Percentage of Employment in UK Manufacturing Industry in 1985	Representativeness of the estimates for UK industry
24*	Manufacture of Ceramic Goods							1.1	The estimate that the MES for establishments is small is representative for the industry. Also the economies for specialisation and production runs apply in much of the industry. In segments, for example fine china, there are economies of scale for marketing.
	Pottery	P.W. Gay and R.L. Smyth 'The British Pottery Industry', London, 1974	UK	Tableware: Factories - the MES is small in relation to UK output	No estimate	Specialisation and production runs - moderate.	'There are economies of scale ... (for firms)... based on marketing, commercial and financial economies'. The economies of scale may be larger for industrial ceramics		
25.	Chemical Industry								
251	Manufacture of Basic Industrial Chemicals							1.9	The estimates showing steep scale gradients for plants making industrial chemicals are representative for this industry.
	Dyes	Pratten 1971[4]	UK	Output of a dye - 100% of UK output Works for producing dyes - estimate not available	17% at half of MES	Output of dyes - large. Production runs - large. Size of works - no estimate.			
	Petro-chemicals	Muller and Owen Owen 1983 (5)	Germany	Ethylene plant, Polyethylene plant, PVC plant - 500,000 tons a year.	19% at 1/3rd MES	Output of plants - large.			
	Sulphuric Acid	Pratten 1971[4]	UK	Plants - 1m. tons a year	1% at ½ MES	Output of plants - large.	Increase in value added per unit 19% at ½ MES.		
		Muller et al 1975[17]	Germany	- 350,000m tons a year	5-10% at 1/3 scale				
	Titanium Dioxide	Pankas 'Chemawat 1984 (7)	USA	Plants - 130,000 tons	8-16% at ½ MES depending on process	Output of plants - large.			
	Synthetic Rubber	Scherer 1980[8] Weiss	USA	Plants - 60,000 tons a year	15% at ½ MES	Output of plants - large.			
255	Manufacture of Paint							0.6	Paint is representative for the other products included in this trade, varnishes and printing ink.
	Paint	Scherer 1975[1]	International	Works for producing paint - 10m. US galls a year/600 employees	4.4% at 1/3rd MES	Production runs - moderate. Products - moderate. Works - moderate. R & D - significant or large in certain segments of the trade	There is scope for specialisation in the industry and for small firms to be competitive for some products.		

NACE3 NUMBER	Industry	Source	Countries for which estimates made	M.E.S. Dimension of Scale - MES Scale for that dimension	Increase in unit costs below MES Scale	Main dimensions of scale to which economies relate	Comments	Size of the Industry Percentage of Employment in UK Manufacturing Industry in 1985	Representativeness of the estimates for UK industry
256	Manufacture of Other Chemical Products							0.9	NACE 256 includes a wide range of products. Generally there are large economies of scale for production of each of these products, but most of them are made in much smaller plants (measured in tons of capacity) than those used for fertilizers.
	Fertilizers	L. Wagner[2] reference to European Chemical News 'Major New Fertilizer Plants', 1976	International	Ammonia plants - 300,000-350,000 tons		Output of plants - large.		0.1 (estimate)	
257	Manufacture of Pharmaceutical Products							1.3	NACE 257 is limited to pharmaceutical products.
	Pharma-ceuticals	Reckie 1975[6]	UK	Works for producing drugs - no estimate but production costs generally a small part of total product costs		Production runs, and Works - scale economies for these dimensions swamped by other factors affecting costs. R & D - large for new drugs. Marketing - large for much of the industry's output.			
258	Manufacture of Soap and Synthetic Detergents							0.6	NACE 258 includes perfumes, cosmetics and toilet preparations for which production costs generally represent a small part of the prices charged to consumers. Economies of scale for production are not very significant for these products and so estimates of economies of scale for detergents and soap are not representative for this heading.
	Soap and Detergents	Pratten 1971[4]	UK					0 2	
	Detergents			Plant - 70,000 tons	2½% at half MES	Marketing - large.			
	Soap			Plant - at least 10,000 tons	No estimate				
26.	Man-Made Fibres							0.2	NACE 26 is confined to man made fibres for which the estimates are representative.
	Nylon, acrylic and polyester fibres	Scherer 1980[8] Weiss 1976(9) R.W. & S.A. Shaw[10]	USA UK	Works - Nylon - 50m lbs a year Acrylic - 47.4m lbs a year Polyester - 40.0m lbs a year Polyester - 100,000 tons a year	12% at ½ MES 9.5% at ½ MES 10% at ½ MES 2 6% at ½ MES	Products - moderate. Production runs - moderate. R & D - moderate.			
	Cellulosic fibres	Scherer 1980[8] Weiss 1976(9)	USA	Works - Filament - 70m lbs a year Rayon staple - 125m lbs a year	5% at ½ MES 5% at ½ MES				
311	Foundries							1.0	NACE 311 includes ferrous and non ferrous foundries, but is confined to foundries. The estimates given are representative.
	Iron castings Cylinder blocks	Pratten 1971[4]	UK	Foundry - 50,000 tons a year	10% at ½ MES	Products - moderate/large.			

NACE3 NUMBER	Industry	Source	Countries for which estimates made	M.E.S. Dimension of Scale - MES Scale for that dimension	Increase in unit costs below MES Scale	Main dimensions of scale to which economies relate	Comments	Size of the Industry Percentage of Employment in UK Manufacturing Industry in 1985	Representativeness of the estimates for UK industry
	Small engineering castings			Foundry - 10,000 tons a year	5% at ½ MES	Production runs - moderate. Foundries - moderate.			
32	Mechanical Engineering								
321	Manufacture of Agricultural Machinery & Tractors							0.5	Tractors and combines are representative for about half of this NACE heading. Some of the other products such as ploughs and harrows are simpler products or the market is limited and so the MES for firms is smaller than for tractors and combines but there are economies for outputs of most of these products.
	Tractors	Muller & Owen 1983 (5)	Germany	Firm - output of tractors assembled at one site - 90,000 tractors a year.	6% at ½ MES	Output of models - moderate. Production runs - moderate.		0.9 (estimate)	
	Combine Harvesters	Muller & Owen 1983[5]	Germany	Firm - output assembled at one site with bought out engines - 20,000 combine harvesters a year.	7.7% at ½ MES	Output of models - slight. Production runs - slight.			
322	Manufacture of Machine Tools							1.2	NACE 322 is confined to machine tools so the description is representative.
	Machine tools	Boston Consulting Group 1985 (11) Pratten 1971(4)	International UK						
	Standard conventional machine tools			Firm - output at one factory - no estimate given	3-5% if output halved	Output of model - moderate. Production runs - moderate. Output at factory - moderate. R & D - large for some types of products	The range of products made by the industry is immense.		
	Sophisticated machine tools made in volume			Firm - output at one factory at least 400 m/t a year					
	Specialised machine tools			Firm - output at one factory - small firms can be competitive if the market for their specialised tools is small					
326	Manufacture of Transmissions Equipment for Motive Power							0.9	NACE 326 includes a wide range of products such as chains, gears and gear boxes. Rather large economies of scale apply to many, but not all of these products. Difficult to assess the representativeness of ball bearings.
	Ball bearings	Muller & Owen 1983[5] Scherer 1975(1) and author's knowledge of the industry	Germany International	Factory - about 800 employees Firm - say 10% of of world market	8-10% at 1/3rd MES No estimate but large economies by concentrating production of different types and sizes of bearings.	Output of products (types & sizes) - large. Production runs - moderate. Output of factories (including economies for outputs of products) - large. R & D - large for some products.	Factories with less than MES may not have significantly higher costs if they specialise.	0.15 (estimate)	

NACE NUMBER	Industry	Source	Countries for which estimates made	M.E.S. Dimension of Scale - MES Scale for that dimension	Increase in unit costs below MES Scale	Main dimensions of scale to which economies relate	Comments	Size of the Industry Percentage of Employment in UK Manufacturing Industry in 1985	Representativeness of the estimates for UK Industry
328	Manufacture of Other Machinery & Equipment							4.3	NACE 328 is a residual heading and includes a wide range of machinery such as compressors, refrigerating machinery, pumps and valves. The MES scale for firms and factories at which these products are made must vary considerably with the complexity of the products and the market for them. Generally there would be large economies of scale for products.
	Diesel engines 50-1500 h.p.	Weiss 1976 (9) Pratten 1971 (4)	USA UK	Firm output of diesels - 5% of US shipments in 1967. 100,000 units of a design.	10% at ½ MES 4% at ½ MES	Output of designs - moderate. Production runs - moderate. Factories - moderate.		0.3 (estimate)	
	Chain saws	Porter 1983 (12)	USA	Firm making petrol chain-saws 150,000 units a year.	No estimate	Insufficient information to complete this section.		<0.1 (estimate)	
33	Manufacture of Office Machinery and Data Processing Equipment							1.0	Again NACE 33 includes a wide range of machinery for which the MES must vary. For most products there are large economies of scale.
	Electronic calculators	I. Wagner 1981 (2) reference to P. Levine Financial Times 19 Jan. 1976	UK	Firm output of calculators - 3-4 million a year	No estimate			0	
	Computers, Mainframes	Johnson (1980) (13) P.L. Stoneman 'Computers'.	UK	Firm output of computers - A large share of the world market	No estimate	Output of mainframes - large. Output of computers for specialised uses - large.		0.15 (estimate)	
	Electronic typewriters	Muller et al 1985 (17)	Germany	Firm output of typewriters - 500,000 a year	5-10% at 1/3rd MES			<0.1 (estimate)	
34	Electrical Engineering							2.1	NACE 342 includes a wide range of electrical machinery. Scale gradients for many of these products could be moderate to large. MES for factories varies with products and is generally small relative to total output for the NACE heading.
342	Manufacture of Electrical Machinery								
	Transformers Distribution transformers Small power transformers Large power transformers	Weiss 1976 (9)	USA	Firms - 2% of US output in 1967 6.9% of US output in 1967 7.1% of US output in 1967	7% at ½ MES 7% at ½ MES 10% at ½ MES	Insufficient information to complete this section		0.2 (estimate)	
	Large Turbo-generators	Pratten 1971 (4) Porter 1983 (12) A.S. Surrey and J.H. Chesshire 'The World Market for Electric Power Equipment' Brighton 1972	UK USA UK	A design - at least four units. Factories - output of at least 6,000 M.W. a year	5% at ½ MES No estimate	Designs - large. Factories - large. R & D - large.		0.1 (estimate)	
	Electric Motors	Pratten 1971 (4)	UK	Factories to make a range of rotors - 10% of UK market in 1970.	15% at ½ MES	Production runs - large Factories - large		0.2 (estimate)	

NACE NUMBER	Industry	Source	Countries for which estimates made	M.E.S. Dimension of Scale - MES Scale for that dimension	Increase in unit costs below MES Scale	Main dimensions of scale to which economies relate	Comments	Size of the Industry Percentage of Employment in UK Manufacturing Industry in 1985	Representativeness of the estimates for UK industry
343	Electrical Equipment for Industrial Use, and Batteries and Accumulators							1.2	
	Auto Batteries	Scherer 1975[1]	International	Factory - 1m. units a year.	4.6% at 1/3rd MES	Factories - moderate.		<0.1 (estimate)	Information for batteries is not representative for this heterogeneous NACE heading.
344	Manufacture of Telecommunications Equipment							4.5	
	Micro processors	F. Malerba - 'The Semi-Conductor Business' London 1985.	USA	Production of types of micro processors by a firm - no estimate of MES, probably greater than the UK market in 1975.	No estimate but large.	R & D - large	Scope for smaller scale production of devices with special applications.	0.2 (estimate)	The estimates are representative in showing large economies of scale for products. The MES scale of factories and firms varies for the wide range of equipment made by the industry.
	Public switches	Muller et al, 1985[17]	Germany	Production of exchanges - 400,000 to 500,000 lines a year.	5-10% at 1/3rd MES			0.4 (estimate)	
		J. Ehnes, M.Phil Thesis Cambridge, 1984. U.K. Monopolies & Mergers Commission 'The GEC & Plessey proposed merger' 1986.	UK	Production of exchanges - 500,000 lines a year. Firms - no estimate but economies through spreading R & D extend far beyond 500,000 lines a year.	4.5% of ½ MES	Production - moderate. R & D - large.			
	PABX's	U.K. Monopolies & Mergers Commission, B.T. & Mitel proposed merger.	UK	No estimate	No estimate	R & D - large.			
344	Manufacture of Radio and Television Receiving Sets							1.3	
	T.V. sets	Muller & Owen 1983[5]	Germany	Factory making a range of sets - 1.1-1.2m. units a year.	15% at 1/3rd MES	Products - moderate/large. Production runs - moderate. Factories - large.		0.2 (estimate)	Similar to NACE 344.
	Videos	Muller et al 1985[17]	Germany	Factory - 0.8-1m units a year.	No estimate				
	Electronic Capital Goods	Pratten 1971 (4)	UK	Output of a product - 100% of UK market	8% at ½ MES	Products - large Production runs - large.		0.6 (estimate)	
346	Manufacture of Domestic Type Electric Appliances							0.8	NACE 346 is a relatively specialised heading. The estimates for large domestic appliances shown are applicable to smaller appliances such as toasters, showers and food mixers but the MES scale of factories making these products would be smaller.
	Fridges and Washing Machines	Muller & Owen 1983[5]	Germany	Factory making two types of fridge 1 to 1.2m units a year Factory making two models of washing machine - 800,000 units a year.	6.5% at 1/3rd MES 7.5% at 1/3rd MES	Products - moderate. Production runs - moderate Factories - moderate.		0.3 (estimate)	

NACE3 NUMBER	Industry	Source	Countries for which estimates made	M.E.S. Dimension of Scale - MES Scale for that dimension	Increase in unit costs below MES Scale	Main dimensions of scale to which economies relate	Comments	Size of the Industry Percentage of Employment in UK Manufacturing Industry in 1985	Representativeness of the estimates for UK industry
35	Manufacture and Assembly of Motor Vehicles							3.1	NACE 35 is limited to motor vehicles and the estimates are representative for this large industry
351	Manufacture of Motor Vehicles								
	Cars	Muller & Owen(5) Altshuler & Others 'The Future of the Automobile', London, 1984. Friedlaender et al. USA 1983 (14) Muller et al 1985(17)	Germany International	Firm making a range of four cars - 2m. units a year	15% at 1/3rd MES	Models - large. Production runs - moderate. Factories - depends upon products. Firms - large.	Economies of scale are smaller for specialist manufacturers and the cost disadvantage can be reduced by buying out components.	+22 for motor vehicle bodies and parts (NACE 352 and 353)	
				Firm - 0.5m units a year.	> 10% at 1/3rd MES				
	Trucks	Muller & Owen(5)	Germany	Firm making a range of trucks of more than 6 tons - 250,000 units a year.	12% at 1/3rd MES	Models - large. Production runs - moderate. R & D - large. Firm - large.			
36	Manufacture of Other Means of Transport								
361	Shipbuilding	Daniel Todd 'The World Shipbuilding Industry' London, 1985.	UK	Shipyards - no estimate.		Series of ships - large.		1.7	NACE 361 includes the building of yachts, ship repairing and breaking for which the economies of scale differ from those for major ship construction. The latter represents less than half of the industry.
	Marine diesels	Pratten 1971(4)	UK	Factory - at least 100,000 h.p. a year.	8% at ½ MES	Designs of engine - moderate. Factories - moderate.		0.1 (estimate)	
363	Manufacture of Cycles							0.1	NACE 363 includes motor cycle production but cycle manufacture is the largest component of this heading in the UK. Motor cycles would be more important than cycles in some European countries. For motor cycles the economies of scale are much greater than for cycles.
	Motor Cycles	Muller et al 1985(17)	Germany	Firm making motor cycles - 200,000 a year.	No estimate				
	Bicycles	Pratten 1971(4)	UK	Factory assembling range of bicycles - less than 100,000 a year.	No estimate but small - the difference in costs depends upon the range of operations performed in-house.	Products - slight. Production runs - slight. Factories - slight.	Firms with small outputs can limit their disadvantage by importing components.		
364	Aerospace Equipment Manufacturing							3.4	Apart from commercial aircraft, the industry develops and manufactures defence equipment. The estimate of large economies of scale for products attributable to spreading large development costs is representative for the industry.
	Aeroplanes	Pratten 1971(4)	UK	Firm making commercial aeroplanes - more than 50 of any model	20% at ½ MES	Models - large. R & D - large. Firm - large.			
37	Instrument Engineering								
371	Instruments	Luc Soete et al. 'Technological Trends and Employment 3 Electronics & Communications', Aldershot, 1985. Instrumentation [illegible]	UK	No estimate		Products - large. R & D - large	The industry makes a very wide range of products	0.8	Generally there are economies of scale for products

NACE3 NUMBER	Industry	Source	Countries for which estimates made	M.E.S. Dimension of Scale - MES Scale for that dimension	Increase in unit costs below MES Scale	Main dimensions of scale to which economies relate	Comments	Size of the Industry Percentage of Employment in UK Manufacturing Industry in 1985	Representativeness of the estimates for UK industry
41/2	**Food, Drink and Tobacco Industry**								
411	**Manufacture of Vegetable and Animal Oils**								
	Soyabean Oil Mills	Connor et al. 1984 (15)	USA	Mill - 4.58% of US shipments c. 1975	4% at 2/3rd MES		In many food trades there is scope for economies of scale for marketing and/or distribution	0.1	
412	**Slaughtering, Preparing and Preserving of Meat**							2.1	
412	Meat packing,	Connor et al. 1984 (15)	USA	Plants - 0.33% of US shipments c. 1975	5% at 2/3rd of MES				
	Sausage manufacture	D. Lees & J. Morley, 'Competition in the Sausage Market', Jnl. of Ind. Econ. 1970.	UK	Plants - very small	No estimate				
413	**Manufacture of Dairy Products**							0.8	It is difficult to assess the representativeness of these estimates. Probably they are representative.
	Butter	Connor et al. 1984	USA	Factories - 1.29% of US shipments, c. 1975	2% at 2/3rd of MES				
	Cheese	Connor et al. 1984	USA	Factories - 0.63% of US shipments, c. 1975	7% at 2/3rd of MES				
	Milk products	Connor et al. 1984	USA	Factories - 0.40% of US shipments, c. 1975	2% at 2/3rd of MES				
414	**Processing and Preserving of Fruit and Vegetables**							0.3	
	Canned fruit and vegetables	Connor et al. 1984	USA	Factories - 7.23% of US shipments, c. 1975	5-12% at 2/3rds MES				
416	**Grain Milling**							0.1	
	Flour	Connor et al. 1984	USA	Mill - 0.74% of US shipments, c. 1975	21% at 2/3rds of MES				
	Rice	Connor et al. 1984	USA	Mill - 5.15% of US shipments, c. 1975	9% at 2/3rds of MES				

NACE3 NUMBER	Industry	Source	Countries for which estimates made	M.E.S. Dimension of Scale - MES Scale for that dimension	Increase in unit costs below MES Scale	Main dimensions of scale to which economies relate	Comments	Size of the Industry Percentage of Employment in UK Manufacturing Industry in 1985	Representativeness of the estimates for UK industry
419	<u>Bread and Flour Confectionery</u>							2.9	The estimate is representative for most of this industry.
	Bread	Connor et al. 1984	USA	Bakery - 0.2% of US shipments, c. 1975					
470	<u>Sugar Manufacturing and Refining</u>							0.2	Probably the estimate is representative.
	Sugar	Connor et al. 1984	USA	Cane refinery - 1.41% of US shipments, c. 1975	8% at 2/3rds of MES				
472	<u>Manufacture of Animal and Poultry Foods</u>							0.4	NACE 422 includes pet food manufacture for which the economies and advantages of a large market share for marketing are important.
	Animal feeds	Connor et al. 1984	USA	Mills - 0.67% of US shipments, c. 1975	8% at 2/3rds of MES				
423	<u>Manufacture of Other Food Products</u>							1.3	NACE 423 is a residual heading. For both the products for which estimates of scale effects are given large economies of scale apply. These are probably not representative for this industry.
	Breakfast Cereals	Richard Schmalensee 'Entry deterrence in the ready to eat breakfast cereal industry'. Bell Jnl. of Econ. 1978	USA	Firm's share of US market - 3-5%	No estimate				
	Potato crisps	L. Wagner[2], Reference to Bevan, 'The UK Potato Crisp Industry 1960-72' Jnl. of Ind. Econ., 1974	UK	Factory - 30,000-35,000 tons per annum	No estimate				
427	<u>Brewing and Malting</u>							0.7	The estimates are representative for this trade.
	Beer	Scherer 1975[1]	International	Breweries - 4.5m. barr. per year Companies - 3-4 breweries to avoid more than a slight handicap.	5% at 1/3rd MES	Breweries - moderate. Marketing - slight to large depending upon strategy.			
		Cockerill 1984[3]	International	Breweries 3m. barr. per year.	7% at ½ MES				
		Muller et al 1985[17]	Germany	Breweries 2.3m barr. per year.	5-10% at 1/3rd MES				
429	<u>Manufacture of Tobacco Products</u>							0.5	The estimates are representative for this trade.
	Cigarettes	Scherer 1975[1]	International	Factories - 36 billion cigs a year Companies - 1-2 factories	2.2% at 1/3 MES	Factories - slight to moderate Marketing - slight to moderate			
		Muller et al 1985[17]	Germany	Factories - 70 billion cigs. a year	less than 5% at 1/3rd MES				

NACE3 NUMBER	Industry	Source	Countries for which estimates made	M.E.S. Dimension of Scale - MES Scale for that dimension	Increase in unit costs below MES Scale	Main dimensions of scale to which economies relate	Comments	Size of the Industry Percentage of Employment In UK Manufacturing Industry in 1985	Representativeness of the estimates for UK industry
43	Textile Industry								
431	Wool Industry	G.F. Rainie 'The Woollen & Worsted Industry', Oxford 1965	UK				There is an ... 'absence over a large part of the industry of any significant economies of scale'	0.8	For the textile, clothing and footwear industries the estimates are representative of the bulk of the industries, but there are segments of these industries for which the economies of scale are larger than indicated.
432	Cotton Industry	B. Toyne et al.(16) Scherer 1975 (1)	International International			Production runs and and specialization more important than plant economies	Advantages of large weaving firms generally slight	0.6	
	Integrated weaving			Mill - 1.5% of US capacity c. 1975					
	Spinning-ring			Mill - little evidence of economies of scale					
	Spinning-open-end Weaving			Mill - 5000-6000 rotas Mill - 300 looms	Significant economies of scale No estimate				
436	Knitting Industry	C. Gulvin 'The Scottish Hosiery & Knitwear Industry 1680-1980	UK				'The advantages of large firms in the knitwear trade seem to have increased but there is still scope for very small firms to set up'.	1.7	
438	Manufacture of Carpets							0.4	
	Carpets Tufted	Weiss 1976(9) and author's knowledge of the industry	USA UK	Factory - 64,000 sq. ft. a week	10% at 50% of MES	Production runs - large.		0.2 (estimate)	
	Axminster						The economies of scale for Axminster carpets are much lower than for tufted carpets.		
45	Footwear and Clothing Industry								
451	Manufacture of Mass-produced Footwear	Muller & Owen 1983(5)	Germany	Factory - 4000 pairs	1.5% at 1/3rd MES	Products - moderate. Advantages of large firms generally slight.		1.0	
	Leather Shoes	Scherer 1975 (1) and author's knowledge of the industry.	International UK		Production runs - moderate Factories - slight.				

NACE3 NUMBER	Industry	Source	Countries for which estimates made	M.E.S. Dimension of Scale - MES Scale for that dimension	Increase in unit costs below MES Scale	Main dimensions of scale to which economies relate	Comments	Size of the Industry Percentage of Employment in UK Manufacturing Industry in 1985	Representativeness of the estimates for UK industry
471	<u>Processing of Paper and Board</u>							0.6	The estimates are representative.
	Linerboard	Weiss 1976[9]	USA	Mill - 850 tons a day	8% at 50% of MES				
	Kraft paper	Weiss 1976[9]	USA	Mill - 896 tons a day	13% at 50% of MES				
	Printing paper	Weiss 1976[9]	USA	Mill - 567 tons a day	9% at 50% of MES				
472	<u>Conversion of Paper and Board</u>							7.4	The industry makes a wide range of products. The estimate for diapers is not representative.
	Disposable Diapers	Porter 1983[17]	USA	Factory - 3-4 machines about 3% of US capacity.	No estimate	Factories - moderate/ large. R & D - moderate/ large.		<0.1 (estimate)	
473	<u>Printing and Allied Industries</u>							6.0	The industry includes publishing. The estimates are representative in showing large economies of scale for products attributable to spreading first copy costs.
	Book printing	Pratten 1971[4]	UK	Titles - Hardback - 10,000 Paperback - 100,000 Firm - 2% of UK industry in 1971.	36% at 50% of MES 20% at 50% of MES				
48	<u>Processing of Rubber and Plastics</u>								
	<u>Manufacture of Rubber Products</u>							1.3	
481	Tyres for passenger cars	Weiss 1976[9]	USA	Factory 16,500 tyres per day (5m a year)	5% at 50% of MES		Economies of scale for remould tyres much less.	0.4 (estimate)	Taken together the estimates for tyres and G.R.G. are representative for this industry.
		Muller et al 1985[17]	Germany	9m a year	5-10% at 1/3rd MES				
	General rubber goods (G.R.G.)	C. Pratten and A. Silberston 'The Optimum Scale in the Production of General Rubber Goods', NEDO, London, 1967.	UK			Products - slight to large economies of scale. Factories - small factories can be competitive.		0.9 (estimate)	
483	<u>Processing of Plastics</u>							0.4	The estimates are representative.
	Moulded plastic products	Pratten 1971[4]	UK			Products - slight to large economies of scale. Factories - small factories can be competitive in this trade.			

Footnotes

(1) F.M. Scherer et al. 'The Economies of Multi-Plant Operations. Cambridge, USA and London 1975.

(2) L. Wagner 'Readings in Applied Macroeconomics'. 2nd Edition, Oxford 1981.

(3) In T.T. Jones and T.A.J. Cockerill 'Structure and Performance of Industries'. New Delhi, 1985, and A. Cockerill in collaboration with A. Silberston 'The Steel Industry International Comparisons of Industrial Structure and Performance' Cambridge, 1974.

(4) C.F. Pratten 'Economies of Scale in Manufacturing Industry', Cambridge 1971.

(5) Jurgen Muller and Nicholas Owen, 'Economic Effects of Free Trade in Manufactured Products within the EC' Berlin, 1983.

(6) W. Duncan Reekie, 'The Economies of the Pharmaceutical Industry', London 1975.

(7) Pankas Ghemawat, 'Capacity Expansion in the Titanium Dioxide Industry', Jnl. of Ind. Econ. Dec. 1984.

(8) F.M. Scherer, 'Industrial Market Structure and Economic Performance', 1980.

(9) Leonard W. Weiss 'Optimal Plant Size and the Extent of Suboptimal Capacity' in 'Essays on Industrial Organisation in Honour of Lae S. Bain', Edited by R.T. Masson & P. David Qualls, Massachusetts, 1976.

(10) R.W. and S.A. Shaw, 'Synthetic Fibres' in 'The Structure of British Industry'. Edited by P.S. Johnson, London, 1980.

(11) Boston Consulting Group, 'Strategic Study of the Machine Tool Industry' for the E.C. 1985.

(12) Michael E. Porter, 'Cases in Competitive Strategy', New York, 1983.

(13) P.S. Johnson 'The Structure of British Industry', London 1980.

(14) Friedlaender, Winston & Wang, 'Costs, technology and productivity in the US automobile industry', The Rand Jnl. of Econ. Vol. 14, No. 1.

(15) J.M. Connor, R.T. Rogers, B.W. Marion, W.F. Mueller, 'The Food Manufacturing Industry', Gower Publishing Co. Ltd.

(16) B. Toyne et al. 'The Global Textile Industry', London 1984.

(17) Jurgen Muller et al 'Empirische Untersuchung von industriellen Grobenvorteilen (Economies of Scale) nach der Methode der Ingenieurschatzengen, Berlin, 1985.

Glossary of Terms used in Table 5.1

MES - Minimum efficient scale. This term was defined on page 2. In Table 5.1 the definition used by the authors of the studies surveyed varies. The definitions used for the main sources are reported on page 35 and 50.

Dimensions of scale. These were described on page 3.

Plants, works, factories. The term establishment is used for censuses of production. It refers to the operations of a firm at a single site. In practice different terms are used for such operations. In the steel industry the terms steel plant or steel works are used, works is the term used in the cement industry and for footwear the term is factory.

Firms, companies. The term enterprise is used for censuses of production for firms operating one or more establishments in a trade. For Table 5.1 the terms firms and companies are used for this purpose.

estimates of unit costs do not identify a scale at which costs are at a minimum. The two main sources of information for Table 5.1 are the studies made by Pratten (1971) and by Scherer (1975). The latter study has spawned derivatives including Owen's and Muller and Owen's studies. Pratten used the following definition of the MES: 'the minimum scale above which any possible doubling in scale would reduce total unit costs by less than five percent and above which any possible subsequent doubling in scale would reduce value added per unit by less than ten per cent'. Also the MES was limited to 'the feasible range of output in ... the UK'. Scherer's definition involved two sets of conditions. 'Where there was considerable experience with plants believed to realize all known scale economies, we have defined the MOS as the smallest scale at which unit costs in 1965 - vintage plants attained a perceived minimum or at least came so close that remaining unexploited scale economies were viewed as insignificantly slight. When little or no experience in the highest-volume and still declining reaches of the long-run cost function existed we defined the MOS as the size of "best current practice" plants in operation during 1965'.

Another definition of the MES for plants and firms lurks in many studies of the economies of scale. Most industries produce a range of products and the market for these products varies. Often the market for some products is small. For multi product industries the MES is sometimes defined as the scale of plant or firm which can make and sell any combination of products and be competitive in terms of costs for those products with larger firms in the industry. This is the definition used in table 5.1 for pottery, machine tools, the knitting industry, general rubber goods and plastics. For some combinations of products the MES could, of course, be much higher than the MES specified for these industries.

The Country of Origin of the Estimates

Column 4 of Table 5.1 reports the country of origin of the estimates. It is sometimes suggested that the size of a country may influence the economies of scale or estimates of the economies of scale. Certainly firms operating in countries with small markets on average have smaller plants. Also, as noted on page 23, firms operating in a country with a small market could be relatively efficient at operating small plants. It may be difficult for managers of these firms to assess costs for large scale operations outside their own operating experience, and this could inject a downward bias on estimates of the economies of scale made in small countries. Pratten's estimates of the MES scale and scale gradients were obtained from managers of firms operating in the UK. Some, but not all of these managers knew about production facilities in the larger US market. Those whose experience and knowledge were limited to the UK market may have given lower estimates of the MES scale than managers of US firms would have estimated.

Scherer's (1975) study is the most helpful for assessing the significance of the countries for which estimates of the MES and the economies of scale were made because he studied firms in different countries. If the country of origin had a systematic influence on estimates of the economies of scale, Scherer could be expected to identify this bias. Scherer's sample of six countries ranged in size from Sweden to the USA. He concluded that 'we found little divergence among the views of producers in the six nations with respect to basic process optima, nor did perceived limits on the size of plants which could be managed successfully vary much between nations for a given product mix'.[1] 'Much more variance was encountered in estimates of the amount by which unit costs rose for plants built with only one-third of the MOS capacity. These deviations were evidently attributable at least in part to systematic international differences in factor costs and especially wages'. In terms of factor costs, Scherer's sample stretched from India to the USA. Most of the estimates surveyed in Table 5.1 were obtained in the USA or Europe. Factor prices in Europe and the USA are closer than they were in 1965 when Scherer made his study.

Engineering estimates generally relate to new plants, factories or production facilities set up at the time the estimates are made. Differences in relative factor prices are an important influence on whether firms install new plant, technology and methods, or soldier on with the existing production facilities. Countries where wages are relatively low have an incentive to retain in use small old plants which may operate efficiently at lower scales than new plant.

Size of country is not the only factor which could cause differences in estimates of economies of scale between countries. For example, Germany has special rules for brewing beer. Such rules could affect the MES scale of production. However, such differences of rules for production are unusual and their effects on estimates of the MES are not important.

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(1) F.M. Scherer et al. 'The Economies of Multi-plant Operation', Cambridge, Mass. 1975, p. 81.

Costs

Most engineering estimates concentrate on production costs. Scherer specifically limited his estimates of the MOS to production costs. The reason for excluding selling and distribution costs is that they vary depending on the characteristics of the market assumed. Nor, in practice, can engineering estimates allow for differences in the effectiveness of management attributable to scale.

Jurgen Muller et al. (1985) go further and exclude development costs from their estimates of MES and scale gradients.

Overview of Table 5.1

There are several features of Table 5.1 which are noteworthy. Firstly, the industries for which engineering estimates of economies of scale have been made are spread right across manufacturing industry. Secondly substantial economies of scale relate to the output of products and production runs. In many trades these dimensions of scale are more important than the size of plants and firms. Thirdly, the extent of economies of scale vary across industries and for different products made in many industries.

Extending the Coverage of Estimates of the Estimates of the Economies of Scale.

Table 5.2 relates trades for which no estimates of the economies of scale are available to trades for which such estimates are to hand. The purpose of the table is to extend, in a rough and ready way, the number of trades for which estimates of the economies of scale are available for statistical exercises. The basis for making the allocation is the

Table 5.2 Economies of Scale for Manufacturing Trades

	(2)	(3)	(4)	(5)	(6)
NACE3 Number	Trades for which estimates of the economies of scale are not available	Size of the Industry: Percentage of Employment in UK manufacturing industry in 1985	NACE3 Number	Trades for which information about the economies of scale is available and can be used for the trade listed in column (2)	Comments
323	Textile machinery	0.2	322	Machine tools	
324	Machinery for the food, chemical and related industries; process engineering industries	1.0	322	Machine tools	Similar to specialised machine tools. Large firms have advantages for tendering for large overseas contracts.
325	Mining machinery, construction and mechanical handling equipment	1.6	322	Machine tools	
327	Machinery for printing, paper, wood, leather, rubber, glass and related industries; laundry and dry cleaning machinery	0.6	322	Machine tools	
328	Miscellaneous machinery and mechanical equipment	4.3	322	Machine tools	
345	Miscellaneous electronic equipment	1.3	344	Electronic Capital Goods	
362	Railway and tramway vehicles	0.6	321	Manufacture of Agricultural Machinery and Tractors	
365	Miscellenous vehicles	0.1	363	Cycles and Motor Cycles	
371	Measuring, checking and precision apparatus.	0.8	344	Electronic Capital Goods	
372	Medical and surgical equipment and orthopaedic appliances	0.3	344	Electronic Capital Goods	
373	Optical precision instruments and photographic equipment	0.4	344	Electronic Capital Goods	

complexity of the products and the manufacturing processes used. No attempt was made to classify chemical, food, textile, clothing or footwear trades in this table. In very broad terms, trades in these groups are adequately represented by the observations included in Table 5.1.

The next stage of the analysis was to relate the estimates of economies of scale to the complete NACE3 classification in Table 5.3(a) and to assess the economies of scale for each industry group or branch. The number of employees engaged in each trade in EC10 is shown in column 3 of the table to indicate the relative importance of each trade. Some additional observations and references to statements about the economies of scale are added.(1) The observations are based on the author's knowledge of the industries obtained during visits to firms.

In the final column of Table 5.3(a) a summing up on the economies of scale for each industry group is attempted. This survey concentrates on the economies of scale for production and the spreading of development costs. For the most part economies of scale for marketing distribution and acquiring finance are ignored.

An ordering of industry groups in terms of the importance of economies of scale is attempted in Table 5.3(b). This classification is qualitative, but it takes into account two indicators - the MES as a percentage of the output of industries and the cost gradient below the MES scale. An attempt is also made in this table to indicate the principal dimension of scale to which economies relate in each industry. For two industries two dimensions are ticked because in the case of

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(1) Studies which include quantitative estimates are included in Table 5.1; the additional reference in Table 5.3 are qualitative.

Table 5.3(a) Economies of Scale for Industry Groups

NACE NO.	Description	Number of Employees in EC10 (thousands)	Comments on Scale Economies	The Economies of Scale for Industry Groups
11	Extraction and briquetting of solid fuels			
12	Coke ovens			
13	Extraction of petroleum and natural gas			
14	Mineral oil refining		See Table 5.1	
15	Nuclear fuels industry		Large economies of scale for production processes & R & D	
16	Production and distribution of electricity, gas, steam and hot water		Economies of scale for generating stations and distribution	
161	Generation and distribution of electric power			
162	Gasworks; gas distribution			
163	Production and distribution of steam, hot water, compressed air, district heating plants			
17	Water supply; collection, purification and distribution of water			
21	Extraction and preparation of metalliferous ores			
211	Extraction and preparation of iron ore			
212	Extraction and preparation of non-ferrous metal ores			
22	Production and preliminary processing of metals	982		
221	Iron and steel industry (as drined in the ESRC Treaty), excluding integrated coke ovens	559	See Table 5.1	
222	Manufacture of steel tubes	104	Large economies of scale for the production processes used in making many types of tubes	Metal Industries Generally large economies of scale for production processes. Scale economies also relate to the output of products and production runs.
223	Drawing, cold rolling and cold folding of steel	101	Wire netting: See Table 5.1	
224	Production and preliminary processing of non-ferrous metals	208	Aluminium, semi manufactures: See Table 5.1	
23	Extraction of minerals other than metalliferous and energy-producing minerals: peat extraction	85		
	[illegible] of building materials and	45		

NACE NO.	Description	Number of Employees in EC10 (thousands)	Comments on Scale Economies	The Economies of Scale for Industry Groups
232	Mining of potassium salt and natural phosphates	40		
24	Manufacture of non-metallic mineral products	876		
241	Manufacture of clay products for constructional purposes	78	Bricks: See Table 5.1	
242	Manufacture of cement, lime and plaster	78	Cement: See Table 5.1	Non-metallic Mineral Products For cement and flat glass there are large economies of scale for production processes. For other trades, MES plants are generally much smaller in relation to industry output. There are economies for large outputs of products and production runs. Trade in these goods is limited by relatively heavy transport costs.
243	Manufacture of concrete, cement or plaster products for constructional purposes	209	Plasterboard: See Table 5.1 Generally limited economies of scale and heavy transport costs for moving products	
243.1	Manufacture of asbestos-cement products			
243.6	Manufacture of ready-mixed concrete			
244	Manufacture of articles of asbestos (except articles of asbestos-cement)	19		
245	Working of stone and of non-metallic mineral products	67		
246	Production of grindstones and other abrasive products	17		
247	Manufacture of glass and glassware	209	Glass bottles: see Table 5.1 Flat glass. Large economies of scale for the production of flat glass.	
248	Manufacture of ceramic goods	207	See Table 5.1	
25	Chemical industry	1507		
251	Manufacture of basic industrial chemicals and manufacture followed by further processing of such products	671	See Table 5.1	
255	Manufacture of paint, painter's fittings, varnish and printing ink	161	See Table 5.1	
256	Manufacture of other chemical products, mainly for industrial and agricultural purposes		See Table 5.1	Chemical Industry Generally large economies of scale for production processes; this applies particularly to continuous production processes but also to batch production. For some important segments R & D is a source of large scale economies.
257	Manufacture of pharmaceutical products	303	See Table 5.1	
258	Manufacture of soap, synthetic detergents, perfume and toilet preparations	157	See Table 5.1	
259	Manufacture of other chemical products, chiefly for household and office use	98		
259.1	Manufacture of photographic chemical material (sensitized photographic film, plate, paper, etc., and auxilliary products)			

NACE NO.	Description	Number of Employees in EC10 (thousands)	Comments on Scale Economies	The Economies of Scale for Industry Groups
259.2	Manufacture of polishes and the like for household use (shoe, furniture and floor care products, metal polishes, car polishes, etc.)			
26	Man-made fibres industry	62	See Table 5.1	Man-made Fibres Generally large economies of scale.
31	Manufacture of metal articles (except for mechanical, electrical and instrument engineering and vehicles)	1747		
311	Foundries	253	See Table 5.1	
312	Forging; drop forging, closed dieforging, pressing and stamping	130	Economies for products and production runs	
313	Secondary transformation, treatment and coating of metals	258		
314	Manufacture of structural metal products (incl. integrated assembly and installation)	246		Metal Goods Generally economies of scale for large plants less important but there are economies for large outputs of products and long production runs.
315	Boilermaking, manufacture and reservoirs, tanks and other sheet-metal containers	216		
316	Manufacture of tools and finished metal goods, except electrical equipment	653	Metal cans, S.J. Prais 'Productivity and Industrial Structure' Cambridge 1981. Vast number produced and transport costs limit concentration of this industry.	
316.5	Manufacture of domestic heating appliances and kitchen heating appliances of all kinds			
316.6	Manufacture of metal furniture (including safes)			
319	Other metal workshops not elsewhere specified			
32	Mechanical engineering	2144		
321	Manufacture of agricultural machinery and tractors	161	See Table 5.1 for tractors and combines.	
322	Manufacture of machine-tools for working metal, and of other tools and equipment for use with machines	254	See Table 5.1	
323	Manufacture of textile machinery and accessories: manufacture of sewing machines	91	Similar to machine tools	Mechanical Engineering Economies of scale for large factories and firms limited but there are large economies relating to outputs of models, designs and types of machines and economies for long production runs. The availability of a skilled and experienced labour force very important in these trades.
324	Manufacture of machinery for the food, chemical and related industries	236	Similar to machine tools	
325	Manufacture of plant for mines, the iron and steel industry and foundries, civil engineering	385	Similar to machine tools	

NACE NO.	Description	Number of Employees in EC10 (thousands)	Comments on Scale Economies	The Economies of Scale for Industry Groups
326	Manufacture of transmission equipment for motive power	165	Ball bearings See Table 5.1	
327	Manufacture of other machinery and equipment for use in specific branches of industry	134	Similar to machine tools	
328	Manufacture of other machinery and equipment	711	Diesel engines and chain saws See Table 5.1.	
33	Manufacture of office machinery and data processing machinery	208	See Table 5.1	<u>Office machinery</u> Large economies of scale for products.
34	Electrical engineering			
341	Manufacture of insulated wires and cables	2483		
342	Manufacture of electrical machinery (comprising electric motors, electricity generators, transformers, switches, switchgear and other basic electrical plant).	712	See Table 5.1	
343	Manufacture of electrical apparatus and appliances for industrial use; manufacture of batteries and accumulators		Auto batteries: See Table 5.1	
344	Manufacture of telecommunications equipment, electrical and electronic measuring and recording equipment, and electro-medical equipment	746	See Table 5.1 Electronic equipment similar to electronic capital goods	<u>Electrical Engineering</u> Generally large economies of scale relating to products - turbo generators, public switches, T.V. sets. These economies relate to spreading development costs and production.
345	Manufacture of radio and television receiving sets, sound reproducing and recording equipment and of electronic equipment and apparatus (except electronic computers); manufacture of gramophone records and prerecorded magnetic tapes.	335	See Table 5.1	
346	Manufacture of domestic type electric appliances	209	See Table 5.1	
347	Manufacture of electric lamps and other electric lighting equipment	71		
348	Assembly and installation of electrical equipment and apparatus (except for work relating to the wiring of buildings)			
35	Manufacture of motor vehicles and of motor vehicle parts and accessories	1751		<u>Motor Vehicles</u> Very large economies of scale for production and for spreading development costs for models.
351	Manufacture and assembly of motor vehicles (including road tractors) and manufacture of motor vehicle engines		See Table 5.1	

NACE NO.	Description	Number of Employees in EC10 (thousands)	Comments on Scale Economies	The Economies of Scale for Industry Groups
352	Manufacture of bodies for motor vehicles and of motor-drawn trailers and caravans			
36	Manufacture of other means of transport	758		Other Vehicles Variable scale effects, low for cycles and ship-building though there are economies for large outputs of designs for ships but very large economies of scale for aircraft by spreading development costs.
361	Shipbuilding	254	See Table 5.1	
362	Manufacture of standard and narrow-gauge railway and tramway rolling-stock	92	Similar to manufacture of agricultural machinery and tractors	
363	Manufacture of cycles, motor-cycles and parts and accessories thereof	59	See Table 5.1.	
364	Aerospace equipment manufacturing and repairing	345	See Table 5.1	
37	Instrument engineering	289	See Table 5.1	Instrument Engineering Large economies of scale for outputs of products through spreading development costs.
371	Manufacture of measuring, checking and precision instruments and apparatus	116	Similar to electronic capital goods	
372	Manufacture of medical and surgical equipment and orthopaedic appliances (except orthopaedic footwear)	73	Similar to electronic capital goods	
373	Manufacture of optical instruments and photographic equipment	66	Similar to electronic capital goods	
374	Manufacture of clocks and watches and parts thereof	36		
41/42	Food, drink, and tobacco industry			
411	Manufacture of vegetable and animal oils and fats	43		
412	Slaughtering, preparing and preserving of meat (except the butchers' trade)	294		
413	Manufacture of dairy products	231		
414	Processing and preserving of fruit and vegetables	103		
415	Processing and preserving of fish and other sea foods fit for human consumption	64	See Table 5.1	Food Industry The main source of technical economies of scale is for large plants but MES scale of plants generally small in relation to trade output in the UK. There are also scale economies for marketing and distribution.
416	Grain milling	32		
417	Manufacture of spaghetti, macaroni, etc.			
418	Manufacture of starch and starch products	22		
	[illegible]	284		

NACE NO.	Description	Number of Employees in EC10 (thousands)	Comments on Scale Economies	The Economies of Scale for Industry Groups
420	Sugar manufacturing and refining		See Table 5.1	
421	Manufacture of cocoa, chocolate and sugar confectionery	176	For chocolate confectionery there are large economies of scale for factories and production lines for products. Cowling et al 'Mergers and Economic Performance', Cambridge 1980, Marketing economies of scale are described.	
422	Manufacture of animal and poultry foods (including fish meal and flour)	76	See Table 5.1	
423	Manufacture of other food products	148		
424	Distilling of ethyl alcohol from fermented materials; spirit distilling and compounding	70		
425	Manufacture of wine of fresh grapes and of beverages based thereon	25		Drink and Tobacco Moderate economies of scale for large breweries. Slight economies of scale for large cigarette factories. Marketing economies of scale are more important.
427	Brewing and malting	148	See Table 5.1	
428	Manufacture of soft drinks, including the bottling of natural spa waters	70		
429	Manufacture of tobacco products	96	Cigarettes: See Table 5.1	
43	Textile industry	1054		
431	Wood industry	158	See Table 5.1	
432	Cotton industry	269		
433	Silk industry			
434	Preparation, spinning and weaving of flax, hemp and ramie			
435	Jute industry	12		Textiles Generally the economies of scale are more limited than in most other sectors but there are economies for specialisation and for long production runs.
436	Knitting industry	297	See Table 5.1	
437	Textile finishing	93		
438	Manufacture of carpets, linoleum and other floor coverings, including leathercloth and similar supported synthetic sheeting	61		
438.1	Manufacture of carpets, carpeting, rugs, etc. from all types of fibres		Carpets: See Table 5.1	
438.2	Manufacture of linoleum and similar floor coverings (on paper, board or textile base)			

NACE NO.	Description	Number of Employees in EC10 (thousands)	Comments on Scale Economies	The Economies of Scale for Industry Groups
439	Miscellaneous textile industries	91		
44	Leather and leather goods industry (except footwear and clothing)	86		Leather Goods Generally small economies of scale. Some economies for specialisation and long production runs.
441	Tanning and dressing of leather	36		
442	Manufacture of products from leather and leather substitutes	50		
45	Footwear and clothing industry	975		
451	Manufacture of mass-produced footwear (excluding footwear made completely of wood or of rubber)	232	See Table 5.1	
453	Manufacture of ready-made clothing and accessories	689	Small factories and firms can be competitive but there are economies for specialisation and long production runs.	Footwear and Clothing Slight economies of scale for large factories but some economies for specialisation and long production runs.
455	Manufacture of household textiles and other made-up textile goods (outside weaving mills)			
456	Manufacture of furs and of fur goods	11		
46	Timber and wooden furniture industries	688		
461	Sawing and processing of wood	51		
462	Manufacture of semi-finished wood products	62		
463	Manufacture of carpentry and joinery components and of parquet flooring	111		Timber and Furniture Industries No evidence of economies of scale for large factories in these industries. But there is scope for economies for specialisation and long production runs for some lines.
464	Manufacture of wooden containers			
465	Other wood manufactures (except furniture)	35		
466	Manufacture of articles of cork and articles of straw and other plaiting materials (including basketware and wickerwork); manufacture of brushes and brooms	19		
467	Manufacture of wooden furniture	373	Furniture, S.J. Prais 'Productivity and Industrial Structure', Cambridge, 1981. No evidence of substantial economies of scale. The size of factories is very varied. Paul Wannacott 'The US and Canada: The Quest for Free Trade' Washington 1987. Comments suggest there are large economies of scale for specialisation and long production runs.	

NACE NO.	Description	Number of Employees in EC10 (thousands)	Comments on Scale Economies	The Economies of Scale for Industry Groups
47	Manufacture of paper and paper products printing and publishing	1206		
471	Manufacture of pulp, paper and board	166	See Table 5.1	Paper, Printing and Publishing There are large economies of scale for paper mills. There are large economies of scale for titles, but small printing presses are not at a disadvantage for work involving short runs.
472	Processing of paper and board	347		
473	Printing and allied industries	610	Books: See Table 5.1	
474	Publishing		For publishing and printing newspapers, periodicals and books there are large economies for titles by spreading first copy costs and set up costs.	
48	Processing of rubber and plastics	817		Rubber and Plastic Products Moderate economies of scale for tyre factories. Economies of scale for factories making general rubber goods and moulded plastic products generally slight but there are moderate to large economies for large outputs of products and/or long production runs.
481	Manufacture of rubber products	334	Tyres and GRC: See Table 5.1	
482	Retreading and repairing of rubber tyres			
483	Processing of plastics	505	Plastic goods: See Table 5.1	
49	Other manufacturing industries	192		Other Manufacturing Industries Typically firms in these trades operate from small factories. There may be scale economies for specialisation and long production runs.
491	Manufacture of articles of jewellery and goldsmiths' and silversmiths' wares: cutting or otherwise working of precious and semi-precious stones	53		
492	Manufacture of musical instruments	15		
493	Photographic and cinematographic laboratories			
494	Manufacture of toys and sports goods	72	There are economies of scale for specialization and large outputs of products.	
495	Miscellaneous manufacturing industries	38		
50	Building and civil engineering			
500	General building and civil engineering work (without any particular specialization) and demolition work			
501	Construction of flats, office blocks, hospitals and other buildings, both residential and non-residential			
502	Civil engineering: construction of roads, bridges, railways, etc.			
503	Installation (fittings and fixtures)			
504	Building completion work			

Table 5.3(b) <u>Ranking of Manufacturing Industry Groups by Economies of Scale</u>

Industry groups are listed in order of the importance of economies of scale for spreading development costs and for production costs.

	Principal dimensions of scale to which economies relate: Products and production runs	Size of establishment	Size of firms
1. Motor vehicles	√		√
2. Other vehicles	√		
3. Chemicals	√		
4. Man-made fibres	√		
5. Metals		√	
6. Office machinery	√		
7. Mechanical engineering	√		
8. Electrical engineering	√		
9. Instrument engineering	√		
10. Paper, printing and publishing	√	√	
11. Non metalic mineral products	.	√	
12. Metal goods	√		
13. Rubber and plastic products	√		
14. Drink and tobacco		√	
15. Food		√	
16. Other manufacturing industries			
17. Textiles	√		
18. Timber and furniture	√		
19. Footwear and clothing	√		
20. Leather goods	√		

motor vehicles it is difficult to distinguish between the economies for large outputs of products and large firms(1) and for paper, printing and publishing, size of plants are very important for paper products and for printing and publishing. The output of book, periodical and newspaper titles is highly important. This very crude test indicates that the output of products and production runs are the principal dimensions of scale to which economies for development and production costs relate.

Estimates of the Economies of Scale for Products, Production Runs and Specialisation

Most industries produce a wide range of products and so there is scope for varying output of products, for production runs of varying length and specialisation. (A production line or plant specialising on a narrow range of products is in effect an example of production of long runs). There are many references in the literature to the cost advantages of specialisation and long production runs. For example, in 1960, Professor Verdoorn suggested that differences in the length of production runs 'might well account for a considerable part of the differences in productivity' between America and Europe. He suggested the diversity of technical processes carried out in the same plant was much smaller in America.(2)

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(1) In this industry firms have to be large to have large outputs of products.

(2) E.A.G. Robinson, ed., 'Economic Consequences of the Size of Nations', London, 1960, p. 346.

The extent of the economies of long runs and large outputs of products are elusive. The economies of long production runs relate to the use of larger capacity, more efficient equipment as output increases, learning effects and the spreading of the costs of organising production runs. For products which may be made in repeated production runs, development costs can be spread. A substantial and increasing proportion of the costs of firms are fixed or semi-fixed relative to the output of products. These costs include design and development costs, the costs of setting up specialised production facilities and tooling, and product related marketing expenditure.

Increases in trade and hence scale since 1970 have directly increased the length of production runs and outputs of products. The increase in incomes and availability of imports on the other hand has enabled customers to be more choosy. European firms have reduced production of many standard traditional products and moved up market making new and distinctive products. These forces have reduced the average output of products and production runs in Europe, and increased the importance of these dimensions of scale for an assessment of the economies of scale.

One of the problems of assessing the effects of a general increase in the length of production runs for, say, dyes or paints is that such a change is remote from the expectations of managers. Also, in the short run firms would not change their plant and equipment in response to an increase in the length of run. In the long term firms would respond to a, say, doubling of length of production runs by installing larger units of plant and equipment.

Table 5.4 lists some estimates based on production conditions in the UK circa 1970. Substantial economies of scale are indicated in Table 5.4. Although only five estimates are shown, they are illustrative for many other trades; dyes for batch process trades, machine tools for many mechanical engineering trades, electronic capital goods for instruments, cotton weaving for textiles and clothing and books for printing and publishing. Data is not available to test whether the magnitude of these economies has changed since 1970 but it seems unlikely that there have been substantial changes. New methods of machining machine tool components, electronic chips, and computer type setting may have lowered the economies somewhat.

Throughout much of Table 5.1 and the summaries in Table 5.3 qualitative references were made, the economies for long production runs and for large outputs of products. Also the estimates of economies of scale for establishments and firms analysed below include economies of scale for products and production runs. If 'pushed to the wall' to make an estimate of the effects on unit costs of a doubling in the average output of products, production runs and specialisation from the present levels in the EC, the very rough expected orders of magnitude would be 6 per cent for total unit costs and 14 per cent for value added (total unit costs less the bought out component of costs) per unit. These are very large economies. In terms of marginal costs, the total unit costs of the extra output would be 88 per cent of those for the original output and value added per unit for the extra output would be only 72 per cent of that for the original output.

Table 5.4 Economies for Long Production Runs and Specialisation

NACE3 Code		Percentage Increase in Costs at 50% of MES: total unit costs	Percentage Increase in Costs at 50% of MES: value added per unit	Comments
	Dyes			
251	New dye made in new plant	22	44	The estimates are representative for other batch process industries
	Traditional dye made in industries	17	56	
322	Machine Tools			
	Models of machine tools	5	10	Approximate estimate. The extent of the economies depends upon the level of development costs. Machine tools are representative of much of the engineering industry.
345	Electronic capital goods	8	13	Approximate estimate. The extent of economies depends upon the level of development costs. Electronic capital goods are representative of instruments
432	Cotton weaving (1)	(5) (2)	15	This estimate is representative for the textile, clothing and footwear industries.
473	Books			
	Hardback	36	50	Spreading first copy and set up costs are very important in this trade.
	Paperback	20	30	

(1) MES runs assumed to be 15,500 yds.
(2) Estimate by author.
Source: C.F. Pratten, 'Economies of Scale in Manufacturing Industry', Cambridge, 1971.

Plants

It is clear that the extent of economies of scale for plants varies across industries in terms of the size of MES plants relative to industry output and the increase in costs below the MES scale. Table 5.5 lists the estimates of the MES for plants and relates them to UK and EC output. Table 5.6 summarises the estimates of the MES for plants as a percentage of EC output.

The estimates of the output to which MES scales are related tend to exaggerate output relative to the MES. In many trades there is scope for plants to specialise. For example, steelworks make a wide range of products and all steelworks specialise. Similarly machine tool factories each make a limited range of tools.

Table 5.6 shows that for 5 per cent of the observations the MES scale of plants is less than 2.5 per cent of EC output, and for 63 per cent the MES scale of plants is less than five per cent of EC output. This is a very rough indicator of the size of MES plants because the figures are not weighted. However, when UK employment was used as weights the percentages rose to 60 per cent below 2.5 per cent and 88 per cent below five per cent.(1) The estimates suggest that in most industries the EC market can support 20 or more MES plants. The equivalent figure for the larger EC industrial economies, such as Germany, France, Italy and the UK would be four or more plants.

These estimates understate the impact of scale economies for plants. It is a common observation that many small plants survive in the metal goods, mechanical engineering, textile, clothing and 'other'

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(1) There are severe problems in weighting the observations; it is difficult to assess how representative estimates for special plants are for industries. Should the chemical plants be taken as representative of all chemical plants, etc. Fortunately the broad conclusions are not sensitive to the weights used.

Table 5.5 Scale Economies for Plants[1]

NACE3 Number	Industry	MES Scale	Percentage increase in costs at less than MES scale(3): total unit costs	value added per unit	Output Measure	circa 1983 UK	EC	MES as % of UK Output (1)	EC Output	Size of the Industry: Percentage of Employment in UK Manufacturing Industry in 1985
14	Oil Refineries a day	200,000 barr	4(1/3)		m tons a year	75	406	14	2.6	0.3
221	Integrated Steel Plants	4 m. tons a year	11(1/3)		m tons a year	15	110	27	3.6	(0.8)
	ditto	9.6-12m. tons a year	> 10(1/3)					72	9.8	
	ditto - for flat rolled products	10 mill tons a year	-	"				67	9	
	Mini steelworks	0.7-0.8m tons a year	> 10(1/3)					5	0.7	
2245	Rolled aluminium semi-manufactures	200,000 tons a year	-		th tons a year	175		114	(15)	(0.1)
223	Barbed wire fencing	£0.76 m sales per year in 1986	-					(10)	(2)	(0.04)
	Wire netting	£4m sales per year in 1986	-					(20)	(4)	
241	Bricks - non flettons	25 m bricks a year (at least)	25(1/2)	30(½)	th m a year	3.4	14	1	0.2	0.4
242	Cement	1.3 m. tons a year	26(1/3)		m tons a year	13	133	10	1.0	0.2
	ditto	ditto	> 10(1/3)							
243	Plasterboard	18 - 20m sq mtrs a year	-		m. sq mtrs	121		16	(3)	(0.1)
247	Class bottles a year	133,000 tons	11(1/3)					(5)	(0.5)	(0.1)
248	Pottery	small relative to UK capacity						(2)	(0.2)	1.1

(1) For footnotes see the end of the table.

NACE3 Number	Industry	MES Scale	Percentage increase in costs at less than MES scale(3): total unit costs	Percentage increase in costs at less than MES scale(3): value added per unit	Output Measure	circa 1983 UK	circa 1983 EC	MES as % of UK Output (1)	MES as % of EC Output	Size of the Industry: Percentage of Employment in UK Manufacturing Industry in 1985
251	Petrochemicals	500,000 tons a year	19(1/3)		m tons all plastics a year	2.2	18	23[2]	2.8[2]	(0.2)
	Sulphuric acid	1 m tons a year	1(1/2)	19(1/2)	m tons a year	2.6	18	38	5.6	(0.01)
	ditto	0.35m tons a year	5-10(1/3)					13	2.0	
251	Titanium Oxides	130,000 tons a year	8-16(1/2)		th tons a year Titanium Oxides	206	262	63	50	(0.01)
	Synthetic Rubber	60,000 tons a year	15(1/2)		m tons a year	0.25	1.7	24	3.5	(0.01)
255	Paint	10 m galls. a year	4.4(1/3)		m tons	0.7	3.0	7	2	0.6
256	Fertilizers	300,000-350,000 tons a year	-		m tons a year	1.4	8	23	4.1	(0.1)
258	Detergents	70,000 tons a year	2½(½)	20(½)				207	(3)	
	Soap	10,000 tons a year	-					(4)	(1)	(0.2)
26	Synthetic fibres									
	Nylon	50 m.lbs a year	12(½)					4[2]	1[2]	0.2
	Acrylic	42.4m lbs a year	9.5(½)		th tons of the synthetic fibres	530	1,901	4	1[2]	
	Polyester	40m lbs a year	10(½)					3[2]	1[2]	
		100,000 tons a year	2.6(½)					18	5[2]	
	Cullulosic fibres	70 m lbs a year	5(½)		th tons a year	25	188	125	16	
	Rayon staple	125 m lbs a year	5(½)		"	128	246	40	23	

NACE3 Number	Industry	MES Scale	Percentage increase in costs at less than MES scale(3): total unit costs	Percentage increase in costs at less than MES scale(3): value added per unit	Output Measure	circa 1983 UK	circa 1983 EC	MES as % of UK Output (1)	MES as % of EC Output	Size of the Industry: Percentage of Employment in UK Manufacturing Industry in 1985
311	Foundries Cylinder blocks	50,000 tons a year	10(½)	15(½)	th tons of all iron castings		1,435	3	0.3	1.0
	Small engineering castings	10,000 tons a year	5(½)	10(½)				0.7	0.1	
322	Machine tools	Small relative to UK capacity						(1)	(0.2)	1.2
326	Ball-bearings	800 employee	8-10(1/3)					(20)	(2)	(0.15)
342	Large Turbo-generators	6,000 MW a						(50)	(10)	(0.1)
	Electric Motors	60% of UK market c. 1970	15(½)	20(½)				(60)	(6)	(0.2)
343	Auto batteries	1m units a year	4.6(1/3)		m units a year	4.5	25	(22)	(4)	(<0.1)
344	Public switches	4-500,000 lines a year	5-10(1/3)		m units a year	(2.0)		(25)	(4)	(0.4)
	ditto	500,000 lines a year	4.5 (½)							
	TV sets	1.1-1.2m. units a year	15(1/3)		m units a year	2.9	12.4	(40)	(9)	(0.2)
	Videos	0.8-1m units a year	-						(20)	(<0.1)
346	Refrigerator factory	1.0 - 1.2 m units a year	6.5(1/3)		m units a year	1.3	9.7	(85)	11	0.3
	Washing machine factory	800,000 units a year	7.5(1/3)		m units a year	1.4	8.0	57	10	
361	Marine diesels	100,000 hp a year	8(½)	10(½)				(30)	(5)	(<0.1)
363	Bicycles	100,000 units a year	-		m units a year	(1.0)	10.3	(10)	1	(0.1)

NACE3 Number	Industry	MES Scale	Percentage increase in costs at less than MES scale(3): total unit costs	value added per unit	Output Measure	circa 1983 UK	EC	MES as % of UK (1) Output	EC Output	Size of the Industry: Percentage of Employment in UK Manufacturing Industry in 1985
411	Soyabean Oil	4.58% of US market c. 1975	4(2/3)							(0.02)
412	Meat packing	0.33% "	5(2/3)							(0.1)
	Sausages	Very small								(0.2)
413	Butter	1.29% "	2(2/3)							(0.2)
	Cheese	0.63% "	2(2/3)							(0.3)
	Milk products	0.40% "	2(2/3)						For most products similar to the share of the US market	(0.2)
414	Canned fruit & vegetables	7.23% "	5-12(2/3)							(0.1)
416	Flour	0.74% "	21(2/3)							(0.1)
	Rice	5.15% "	9(2/3)							(0.1)
419	Bread	0.2% "	-							2.9
420	Sugar	1.4% "	8(2/3)							0.2
422	Animal feeds	0.62% "	8(2/3)							0.4
423	Potato crisps	30,000 - 35,000 tons a year	-					(10)	(2)	(<0.1)
427	Beer	4.5 m barr. per year	5(1/3)		m barr. per year	37	143	12	3	0.7
		3 m " 2-3m	7(½) 5-10(1/3)							
429	Cigarettes	36 bill cigs a year	2.2(1/3)		bill a year	149	566	24	6	0.5
431	Wool industry	Small relative to UK capacity	-					(1)	(less than 1)	0.8

NACE3 Number	Industry	MES Scale	Percentage increase in costs at less than MES scale(3): total unit costs	Percentage increase in costs at less than MES scale(3): value added per unit	Output Measure	Output circa 1983: UK	Output circa 1983: EC	MES as % of UK Output[1]	MES as % of EC Output	Size of the Industry: Percentage of Employment in UK Manufacturing Industry in 1985
432	Cotton spinning	"	-					(1)	(less than 1)	
	Integrated cotton weaving mill	1.5% of US capacity c 1975	-					(5)	(1)	0.6
	Weaving cotton	300 looms	-		th looms installed	18.7	142	2	0.2	
438	Tufted carpets	64,000 sq. ft. a week	10(½)		m. sq mtrs	114		0.3	(0.04)	(0.2)
451	Footwear factory	4,000 pairs a week	1.5(1/3)		m. pairs a year	58		0.3	(0.03)	1.0
471	Linerboard	850 tons a day	8(½)					10[2]	1.3[2]	
	Kraft paper	986 "	13(½)		total output of paper excl. news-print m tons	3.1	23.2	11[2]	1.4[2]	0.6
	Printing paper	567 "	9(½)					7[2]	0.9[2]	
472	Disposable diapers	3% of US capacity	-					(10)	(2)	(<0.1)
481	Tyres	16,500 tyres a day	5(½)		m.a. year	24	136	17	3	(0.4)

Footnotes

(1) The figures in brackets are guess estimates. In most cases they provide reasonable orders of magnitude.

(2) For many trades, and particularly those referred to footnote (2) the MES should be related to a more narrowly defined output. This would have the effect of increasing the MES as a percentage of output.

(3) The figure shown in brackets indicates the proportion of the MES to which the percentage refers.

Table 5.6 Summary of MES Scale of Plants and Output in the EC

Percentage of EC output	Number of observations	% of total	Weighted by UK employment
0- < 1	20	29	50
1- < 2.5	17	25	10
2.5- < 5	13	19	28
5- < 10	11	16	9
10- < 20	5	7	3
20- < 50	2	3	0
50- < 100	1	1	0
100 and over	-	-	-
	68	100	100

manufacturing industries. However for many of these plants the secrets of survival are that they are sub-contractors or they specialise. Pins provide an example. In Adam Smith's time a whole trade made up of many firms manufactured pins. Now all the production of pins in the UK is concentrated in quite small parts of two factories. For the most part small plants make different product ranges to those made by the large plants, and for these products there are economies for specialisation and large outputs of products. Specialisation can take the form of differences in quality rather than distinct products. A firm with a small plant may specialise in making high quality products or products of low quality and/or specialise in selling own branded products to retailers or selling products without advertising.

Again the estimates of scale gradients in Table 5.5 vary. No doubt the extent of economies does vary for different types of plants but also there is a margin of error for all the estimates. Unfortunately there is no way of estimating the extent of the possible errors. Table 5.7 summarises the increase in costs at ½ the MES for the plants listed in Table 5.5.

Table 5.7 The Increase in Average Costs at half the MES

Increase in costs (percentage)	Number of plants	Plants for which estimates of the increase in average value added are also available	
		Average costs	Average value added per unit
0-2	2	1	-
2-5	16	2	-
5-10	13	2	2
10-15	11	1	1
15-20	1	0	2
20-25	1	1	1
25 and over	1	0	1
	45	7	7
Average	8	9	18

One reason why the estimates of scale gradients vary for different industries is that the proportion of output bought out varies for different types of plant, and the bought out content of output often offers much less scope for economies of scale. Average unit costs and value added per unit are also shown in Table 5.7 for the plants for which both estimates are available. The unweighted average increase in value added per unit is twice that for average unit costs.

It is important to note that the estimates of economies of scale for plants are based on the assumption that the range of products made at a plant is fixed and does not increase with the scale of the plants. The estimates of the effects of increasing the size of plants therefore includes the effects of increasing the output of the products made at the plants and of increasing the length of production runs.

Firms

Table 5.8 lists the MES for firms for the trades for which estimates of the economies of scale for firms were given in Table 5.1. The size of firm is used as the main dimension of scale for these observations because some division of output between plants is possible without substantially increasing costs.[1] Again it is important to note that the economies of larger outputs of products are incorporated in these estimates. It is assumed that the range of products is fixed and does not increase with the size of firms. The reductions in unit costs for large firms includes the cost reducing effects of spreading development costs over a larger output and for longer production runs. The unweighted average MES as a percentage of the EC market was 34 and weighted by UK employment 55. These two estimates are heavily influenced by the motor vehicle and aerospace industries. The increase in costs at half the MES for the six trades for which estimates are available is 9 per cent.

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(1) For example, car manufacturers can separate the manufacture of engines and the assembly of the cars.

Table 5.8 Scale Economies for Firms[1]

NACE3 Number	Industry	MES Scale	Percentage increase in costs at less than MES scale: total unit costs	Percentage increase in costs at less than MES scale: value added per unit	Output Measure	Output circa 1983: UK	Output circa 1983: EC	MES as % of UK Output	MES as % of EC Output	Size of the Industry: Percentage of Employment in UK Manufacturing Industry in 1985
321	Tractors	90,000 tractors a year	6(½)		th a year	92	477	98	19	0.9
	Combine Harvester	20,000 combines a year	7.7(½)		th a year	-	24	-	83	-
328	Diesels	5% of US shipments c 1967	10(½)						similar share to that of the US market	(0.3)
	Chain saws	150,000 units a year	-						(15)	(<0.1)
33	Calculators	3-4 m a year			few calculators are made in Europe					0
	Computers Mainframes	A large share of world output						(100+)	(very large share)	(0.15)
	Electronic typewriters	500,000	5-10(1/3)		m. a year	1.5			(33)	(<0.1)
342	Transformers									
	Distribution	2% of US output c 1967							Similar share to that of the US market	(0.2)
	Small power	6.9% "								
	Large power	7.1% "								
351	Motor cars	2m cars a year	15(1/3)		m.a. year	1.0	9.9	200	20	3.1
		0.5m "[2]	>10(1/3)							
	Trucks	250,000	12(1/3)		m, comm. vehicles	0.24	1.2	104	21	

363	Motor cycles	200,000 units a year		(<0.05)
364	Aeroplanes	More than 50 of a model	(100)	3.4

(1) The figures in brackets are guess estimates. In most cases they provide reasonable orders of magnitude.

Cars and Trucks

The estimates of scale effects for the production of cars are noteworthy for several reasons. First the two estimates of the MES are widely different, two million and 500,000 cars a year. One explanation for this divergence is that the first estimate by Muller and Owen includes the spreading of development costs, while the second estimate by Muller excludes these costs. For cars the effects of spreading product development costs are an important source of economies of scale. The MES estimate of two million cars a year exceeds the production in Europe of any single firm and suggests there would be scale economies associated with further concentration of the industry.

Another reason why the estimates for cars and trucks are of great interest is that they are representative for many products made by the mechanical engineering, electrical and instrument industries. Cars and trucks are more or less complex than the products of these industries, but the main difference is the much greater output in terms of numbers of cars and trucks. This suggests that there are substantial unexploited economies of scale for the production of many products made by these industries. Another example of the economies of scale for precision engineering products continuing to very large outputs is ball bearings. These products are made in vast quantities. SKF claims about twenty per cent of the Western World market. When it was challenged by Japanese producers in the 1970s, it cut costs by rationalising production at its European factories. Each of its subsidiaries in the U.K., France, Germany and Italy ceased to produce a full range; instead they manufactured a limited range and took supplies from other subsidiaries to complete their range.

Another example of economies of scale continuing to very large outputs is for semiconductors. It is claimed that the large domestic markets for chips from the domestic and electronic appliance industries in Japan and the computer industry in the USA have given these countries advantages for chip production.

The output of motor vehicle and computer companies is concentrated on cars and trucks, and computers. In most industries the possible permutations of products for firms is in practice immense and it is difficult to pin down a range of output for estimating the economies of scale. This is the explanation for Table 5.1 including only a few estimates of the MES for firms. Plainly there are economies of scale for, say, giant chemical companies for organising and controlling production of intermediate chemicals, basic research and development, for marketing and distribution, for raising finance and for risk taking. These economies are difficult to estimate but they can not be ignored. In the following section they are described.

Estimates of the MES 1951 to 1982

Many of the estimates of the economies of scale used in this Section were made during the 1960s. Are these estimates accurate for the technological and marketing conditions of the 1980s? Table 5.9 compares estimates of the MES for eight industries for which DIW prepared estimates of the economies of scale in 1982. The DIW estimates are compared with those made by J.S. Bain in 1951[1], and by Scherer, Weiss and Pratten between about 1965 and 1969.

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(1) J.S. Bain, 'Barriers to new Competition', Cambridge, Mass., 1965.

The lower estimate of the MES for cars in 1982 is striking. As noted earlier it may be explained by the fact that the DIW estimates are based on production costs, they do not include the costs of spreading research and development costs.

As is usual with studies of the economies of scale, the pattern is not uniform. On balance there is evidence of an upward drift of the MES scale. The DIW estimates of the MES scale are higher than Bain's for four out of five industries, and the exception is cars. The DIW estimates are higher than those made between 1965 and 1969 for eleven of the sixteen observations and lower in three cases. These results are not surprising. Many technological developments are increasing the MES and the integration of national markets is providing firms with opportunities to test larger scale operations.

Conclusions

In this section engineering estimates of the economies of scale for products have been surveyed. One conclusion is that the economies of scale for production and development costs for complex engineering products such as cars continue to levels of output which represent a substantial fraction of the EC output of the products. Also in these trades scope for achieving some economies continues more or less indefinitely.

For other trades the MES varies in relation to the EC market as does the steepness of the scale gradients. It is not possible to provide a synopsis for these trades.

Table 5.9 <u>Estimates of the MES Scale 1951 to 1982</u>

Industry	MES Scale				
	Bain* 1951+ USA++	Scherer* 1965+ International++	Weiss* 1967+ USA++	Pratten* 1969+ UK++	D.I.W.* 1982+ Germany++
Cars (th. a year)	300-600			1,000 (3 models)	500 (2 models)
Domestic Appliances White Goods (th. a year)		800		500	1,500
Tyres for Cars (th. a day)	4-5		16.5		20-40
Oil Refineries (m. tons a year)	6	10	5.95	10	10
Steel (m. tons a year)	0.9-2.3	3.6	3.6	4.1	9.5-12
Cement (m. tons a year)		1.2		2.0	1.3
Beer (m. hectolitres a year)		5.3	2.4	1.6	2.8
Cigarettes (bills a year)	18-23	36			70

* Source

\+ Approximate year of study

++ Country for which estimates made

Source: The table was prepared from comparisons made by Dr J. Schwalbach

Section 6. Economies of Scale for Firms

A firm which achieves large scale by producing large outputs of individual products, long production runs and operating large plants will achieve the technical economies of scale for production and for spreading development costs which were surveyed in Section 5. In this section, we consider the economies of scale for marketing, research and development and risk taking which may apply to firms making a limited or wide range of products. First, the scope for technical economies of scale for firms making a wider range of products than those included in Section 5 are outlined.

Scale and concentration are related. Other things being equal, if some firms increase their scale of output, concentration increases. Both scale and the degree of concentration affect marketing and research and development expenditure. In this section we side step the relationships with concentration and focus on the scale effects. Completion of the Community will not result in 'other things being equal', it will increase competition within the Community and offset the effects of increased scale leading to greater concentration.

PRODUCTION

It is not possible to generalise about the economies of scope for production costs. For a firm making a range of products, the economies of scope for production relate to processes which are common to a number of products, for example, processes to harden or coat metals or dye textiles.

There are also important technical economies of scope for a firm which produces products by a sequence of operations. Chemicals provide an example. A chemical company which produces a wide range of final chemical products can achieve large scale for the production of intermediate and basic chemicals which are used to produce the final products. These technical economies relate to the scale of production of the basic and intermediate chemicals, to linking processes, to control of the markets for the output of the initial processes and to the coordination of production.

Although it is not possible to quantify these economies except on a case by case basis, they are quantitatively important in some cases.

MARKETING

Scherer has provided the following description of the economies of scale for marketing:(1)

> 'Economies of large-scale promotion and marketing also raise analytic difficulties. For one, they may show up not only in the form of lower costs, but also in the ability of firms to charge prices higher than those of smaller rivals for comparable products, or in some combination of price premiums and cost savings. Thus, both cost curves and demand curves are affected. A second complication is the element of chance associated with sales promotion. A massive advertising campaign may be a spectacular success or a resounding flop, depending upon the ingenuity and luck of the Madison Avenue people in charge. And most important of all, the private benefits realized through large-scale promotion may not be mirrored by benefits to the public. It is not clear that society gains when one firm's monopoly power is bolstered by a successful promotional campaign or whether bleary-eyed television viewers are better off from the barrage of messages to which they are subjected. Here we confine ourselves to the narrower question, to what extent is market concentration encouraged or entrenched by the private advantages of large scale promotion?

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(1) F.M. Scherer, 'Industrial Market Structure and Economic Performance'. Chicago, 1980. p. 108....

2.92

Even there, no simple answer can be provided. In his pioneering study of 20 American industries, Professor Bain concluded that product differentiation was "of at least the same general order of importance ... as economies of large scale production and distribution" in giving established market leaders a price or cost advantage over rivals, and especially over new entrants.(1) (Product differentiation is a condition for the advertising of products by firms). However, a later 12-industry study found that although product differentiation was very important, firms with only a single plant of efficient scale were by no means barred from success.(2) In several industries, single-plant enterprises were able to promote their products on virtually equal terms, realizing all or most scale economies; and in others they could find sizeable market segments in which to operate profitability despite a promotional handicap.

To explore further the reasons for these somewhat disparate conclusions, let us begin by focusing on advertising, which Bain found to be the single most important basis of large-firm advantages.

One possible source of scale economies is the need to attain a certain threshold level of advertising messages before reaching maximum effectiveness. There are two main reasons why this might be so. First, the average consumer's behaviour may not be influenced by a single message, whereas five or six delivered messages (out of a possibly larger number sent) are likely to induce action, if indeed advertising is able to do so at all.(3) Second, when advertising messages are communicated further by word

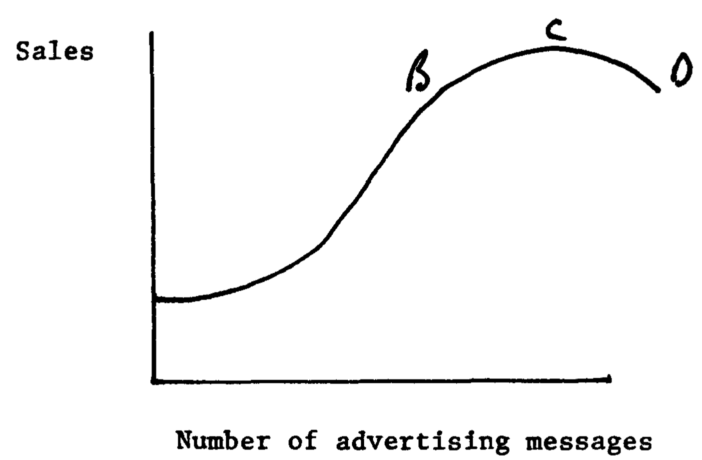
(1) Bain, Barriers to New Competition, pp. 142-43, 216.

(2) Scherer et al, 'The Economies of Multi-Plant Operation', p. 258.

(3) See "Advertising: Frequency and Effectiveness", New York Times, 22 June 1976, p. 57

of mouth and peer influence, conditions analogous to those governing chain reactions or the spread of epidemics may apply.[1] A small impulse soon peters out, but one that affects a sufficiently large initial critical mass spreads rapidly and covers a large segment of the population. To the extent that either of these two models of advertising effectiveness is valid, there must exist an "advertising response function" of the logistic shape illustrated in Diagram 6.1. Over the range AB the threshold (no doubt varying for different consumers) is being approached and surmounted, and the average sales generated by an additional message rise. But beyond point B average returns fall, at first slowly and then (if oversaturation can occur) precipitously.

Diagram 6.1 Advertising response function



There is a debate as to whether the shape assumed in Diagram 6.1 in fact reflects real-world conditions or whether diminishing returns set in immediately. The answer may depend upon the specific advertising medium. Julian Simon has brought together a persuasive body of evidence showing continuously diminishing

(1) See Stephen Glaister, 'Advertising Policy and Returns to Scale Where Information is Passed Between Individuals', Economica 41 (May 1974): 139-56.

returns for direct-mail and clip-out coupon methods.[1] The studies he cites on other media suffer from methodological shortcomings and therefore are less convincing. Perhaps the most carefully controlled marketing research on which a published account is available, covering beer advertising on television, suggests a relationship like Diagram 6.1 but with separate maxima for each of two distinct market segments.[2] When the intensity of Budweiser beer advertising was varied systematically among local markets, increasing returns showed up at lower message levels. But at high intensities, the response function turned downward, as with segment CD. Consumers deluged with Budweiser adds reportedly requested of their liquor dealers, "Give me anything but Bud".

The existence of an increasing returns range AB is not by itself enough to imply an advertising cost advantage for larger firms. If all firms face essentially the same advertising response

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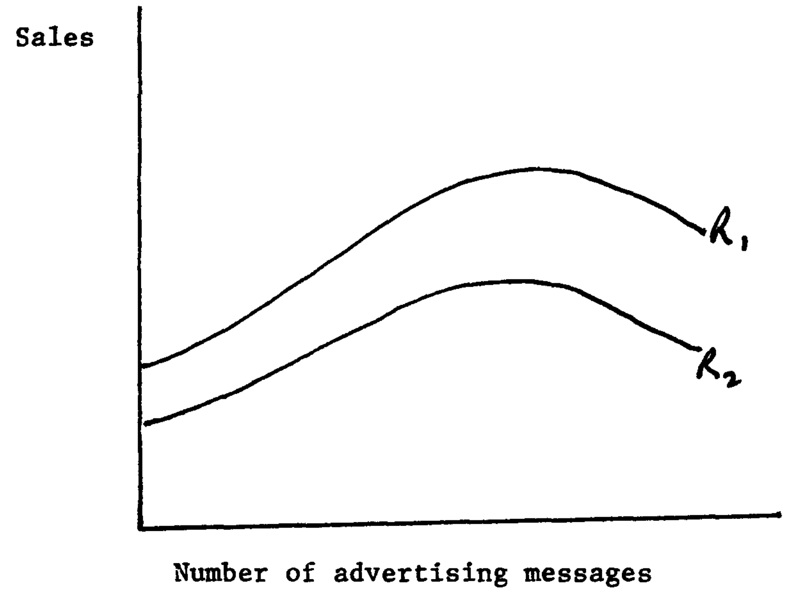
(1) Julian L. Simon, 'Issues in the Economics of Advertising' (Urbana, Ill: University of Illinois Press, 1974), Chapter 1.

(2) Russell L. Ackoff and James R. Emshoff, 'Advertising Research at Anheuser-Busch, Inc. (1963-68)', Sloan Management Review 17 (Winter 1975): 1-15. The response function derived by Ackoff and Emshoff was measured in terms of percentage changes in sales rather than absolute sales levels, but it can be transformed into one like Figure 6.1.

For other evidence on response functions and economies of scale in advertising, see William S. Comanor and Thomas A. Wilson, 'Advertising and Market Power (Cambridge, Mass: Harvard University Press, 1974), pp 49-53; Jean-Jacques Lambin, 'Advertising, Competition and Market Conduct in Oligopoly over Time' (Amsterdam: North-Holland, 1976), pp. 94-98, 127-29; and Randall S. Brown, 'Estimating Advantages to Large-Scale Advertising', Review of Economics and Statistics 60 (August 1978): pp. 428-37.

function, all will find it profitable to carry their advertising to approximately the threshold level B if they advertise at all, and all will thereby enjoy similar sales responses. For economies of scale to exist, there must be some further interacting set of circumstances conferring an advantage to larger firms - e.g., by letting them have different and more favourably configured response functions than their smaller rivals. This may stem from consumer inertia or from physical barriers to the rapid expansion of sales. For example, one supermarket chain may for a variety of historical reasons operate 50 stores in some metropolitan area, another chain only 15. Most of both chains' customers are apt to be tied by force of habit or other considerations to their regular shopping locales; only a small fraction are movable in any given short period by advertising. And if either chain did attract customers very rapidly through advertising, congestion would build up in its aisles, curbing the patronage gains. The large chain may therefore face a response function like LR_1 in Diagram 6.2 while the small chain faces SR_2. If both must send approximately OX advertising messages to achieve a threshold level of awareness, the large chain will cover the population of switchable consumers and reinforce the purchasing habits of its (larger) group of regular patrons at a substantially lower advertising cost per sales dollar than the smaller chain. The response functions facing firms of varying size may also differ because advertising has cumulative as well as current effects. It takes a long time to build an image and get consumers in the habit of requesting Prestone when what the need is ethylene glycol antifreeze. In the short or medium run, the small firm trying to expand its sales of an essentially equivalent product through vigorous advertising runs into sharply diminishing returns long before it has achieved the size of the well-established sellers it is seeking to displace. What this says is that short- or medium-run response functions may differ between small and/or new as compared to large firms, but it does not necessarily imply that over the long run a newcomer cannot gain an equivalent sales volume at comparable advertising cost if it cultivates the market slowly and patiently. Such long-run equivalence may be ruled out as well, however, Diagram 6.2 Possible Advertising Response Functions for Large and Small firms



if more or less permanent marketing advantages accrue to firms that pioneered some product segment, or managed through superior skill or luck to come up with a captivating product image.

This overview of the advantage of size in advertising has skipped over some potentially important tactical details. For one, with respect to what organizational unit are advertising scale economies realized? For supermarket chains, advertising strives to lure consumers into stores, but most advertising by consumer goods manufacturers is focused on individual brands, not (the output of) plants or firms. When threshold effects apply in the latter case, they may have to be attained brand by brand not at the aggregate firm level. Unless there are multibrand interactions, firm size is largely irrelevant. Partly related questions are, how does the array of feasible media vary with firm size, and how in turn are costs affected by any such variations? Jewel, a Chicago area retail grocery chain with the largest local market share, cannot sensibly advertise on nationwide network television or in national magazines. A & P, with a much smaller Chicago position but broader geographical compass might.

Multibrand and multi-product interactions can occur if a favourable reputation from one set of products (e.g. General /Electric's refrigerators) spills over to other products (such as hair dryers), or if the media offer discounts for combining a large volume of advertising, perhaps spanning multiple brands, in one place or time period. Discounts do exist. The New York Times, for example, offered general contract advertisers volume discounts ranging up to 4.5 per cent for buying the equivalent of 40 pages in a year as compared to one
page. ...(1)

Potentially more important than such volume-massing advantages might be the savings nationwide advertisers enjoy by purchasing network time, which, depending upon the time of day, costs 15 to 30 per cent less than what one would pay buying the same coverage through individual station spot messages. For regional firms, more costly spot messages may be the only practical option. ....

For industries like brewing with high product transportation costs, the chief advantage of nationwide multi-plant operation may lie not so much in having a more attractive array of advertising options as in capitalizing fully on the nationwide image one enjoys. That is, somehow or other, certain products catch on, and once they do, the word spreads. As with Coors beer, this can happen even without any advertising outside one's home territory. Once a product does gain a favourable nationwide image, that image is an asset whose full value is captured only through nationwide distribution. If transportation costs are high, this in turn may require the operation of multiple decentralized plants.

Another quite different advantage of large scale is sometimes enjoyed by the sellers of complex durable goods, especially consumer durables. The automobile industry affords the leading example. Most consumers are unwilling to buy a particular new car unless they are confident they can obtain prompt, reliable service not only at home, but wherever they may travel or migrate. This gives the manufacturer with a far-flung, high-quality dealer

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(1) Simon, '<u>Issues in the Economics of Advertising</u>', p. 148

network a sales advantage. Establishing such a network is difficult for the smaller manufacturer, since there are economies of scale at the sales and service establishment level.(1) A certain minimum investment in specialized testing equipment, tools and spare parts is necessary.

The automobile industry provides the premier example of a further interacting advantage of size associated with product differentiation. Through some perverse quirk of human nature, the average consumer is decidedly unhappy driving around last season's assemblage of metal stampings. Body designs are therefore altered periodically-usually with thorough going changes every three to five years and exterior facelifts of varying extent more frequently. This is expensive. (These development costs have been included in the estimates of economies of scale given in Section 5.)

In summary, in at least some industries and especially in certain consumer goods industries, there are appreciable economies of scale in many aspects of sales promotion and product differentiation. The implication conveyed thus far is that these advantages of size and their interactions can lead to market concentration exceeding what is required to realize all narrowly construed production and physical distribution economies. This is correct, but it does not tell the whole story. The product differentiation sword can also cut in the opposite direction. Through successful product differentiation, smaller firms may be able to carve out for themselves a small but profitable niche in some special segment of a large market. Their sales volume may be too low to confer all production and promotional scale economies, but the higher costs associated with foregoing these advantages

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(1) On similar scale economies in servicing computers, see Brock, 'The U.S. Computer Industry', pp. 33-37.

may be more than offset by the price premium consumers pay for the special product features they offer. Product innovation is one tactic by which smaller firms can survive despite conventional scale disadvantages.

Another strategy is to cater to some narrow geographic market segments, or to some special consumer taste with a sales potential too small to interest the leading firms'.

Many small firms do not sell to final consumers. For example, they manufacture and sell machinery or instruments to other firms. Such firms do not use the mass media for advertising. Nevertheless, many small firms of this sort which compete with giant companies fear the marketing advantages of large companies most. The giant companies have much more knowledge about markets - the firms likely to use a product and the people within firms likely to decide whether to buy it, etc. The giant companies can afford to take a loss to gain a sale and even give away some products. Also international companies should be able to rapidly develop export markets for a new product. Where the product is important for the viability of customers then the greater creditibility and reliability of a giant company or a smaller company with a large share of a product market may win orders against smaller competitors and firms with a small share of a market.

Marketing and Completion of the EC

Completion of the EC will provide opportunities for economies of scale for marketing, but economies for advertising are probably of second order importance. Given the language differences in the EC much of the media will remain national.

There are, however, some potential sources of economies. For example, the introduction of more European brands (brands sold in more than one European country) will offer some possibilities for economies. These brands will become progressively more important. They will provide opportunities for spreading the costs of making adverts over a greater audience. (This is a source of economies not included in Scherer's description of economies of scale for advertising[1].) Some advertising messages in existing media, for example, in periodicals which are read in a number of countries, and which are wasted for national brands will score for European brands, and new television channels may provide efficient advertising to a number of European countries simultaneously which will not be cost effective for advertising national brands.

More important are some marketing costs, for example, market research for new products, preparation of catalogues, product descriptions,manuals for new products and other costs of informing potential customers about new products which are an essential part of development costs. Spreading these costs over greater sales will provide important economies in some industries. If national controls for products are harmonised and/or centralised that too will provide a source of very substantial economies for marketing in certain industries. These economies relate to the output of individual products or narrow ranges of products.

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(1) Costs of making television adverts represented of the order of ten per cent of television advertising circa 1970.

RESEARCH AND DEVELOPMENT

Research and development expenditure effects not only the costs of products but also the products and demand. Again, as for marketing, the results of R & D expenditure is uncertain, programmes to develop new products may or may not be successful, and if new products are produced they may or may not be well received by consumers or users. Also much R & D expenditure is in the nature of a sunk cost. A firm can sell many types of capital equipment; there is a second hand market for machine tools, printing machines, etc. The market for half completed R & D projects is not so well developed, and if a firm offers a project for sale it may lose the benefits of secrecy for its innovation. Another feature of R & D expenditure is that in many industries innovation created by R & D is the main key to international competitiveness for European countries.

In this sub-section we start by considering the general relationships between scale and research and development. The bulk of expenditure on R & D expenditure - of the order of 90 per cent of total industrial R & D in the UK - is for development which is product specific. These costs were included in the estimates of economies of scale given in Section 5.

The Sources of Economies of Scale for R & D

One source of economies of scale for R & D is simply the requirement for a large team to develop products such as large commercial aeroplanes. A firm with large R & D resources can devote more staff to such a project and should be able to develop a superior product to those of smaller firms or be able to develop the product faster. These are product specific advantages or economies. Aeroplanes and cars are extreme examples of products which require very large teams of development engineers. Nevertheless, similar economies apply to many other products, including machinery, for which total output in value terms is much less.

Another source of advantage for large chemical and electrical companies such as Hoechst, ICI, IBM, AT & T, GE, Siemens, Philips and GEC is that they have teams of R & D personnel who have and pursue knowledge relevant to their industries, and apply this knowledge. These companies have the equivalent of an internal research university. Smaller competitors have to rely on outside sources of research information and/or have more specialised internal research departments. Compared to a number of smaller competitors a large company can avoid duplication of research.

The potential sources of diseconomies of scale for R & D are that in a large organisation, R & D personnel may not be in close touch with marketing and production staff, and so their work may lose commercial relevance. Commercial motivation may be more difficult to maintain in a large organisation. Also there are the general problems involving the flow of, and assimulation of information and control within large organisations. Finally the ability or talent to successfully organise, manage and carry thorough development projects is scarce even at large companies.

The Importance of Research and Development

Recent technological changes which are considered in Section 8, may on balance have favoured small scale operations, but another powerful economic development has swamped these changes. The vast expansion of markets since 1950 brought about by reductions in barriers to trade and the growth of income, has given large scale producers an increased advantage. The motor industry provides an example. In 1950, there were five companies manufacturing standard cars in Britain, as many as in the USA. They were secure in the much smaller UK market which was protected. For cars and for many other industrial products, the market is now world-wide. Other changes opening national markets have been improvements in transport and communications. Simultaneously industrialization in developing countries has increased competition. Even for each of the larger European countries their markets for cars, telecommunications equipment, chemicals and so on, are only about five per cent of the Western world markets.

An increase in market size operates in two ways to increase the significance of the economies of scale for spreading research and development costs. Firstly, some firms grow larger with the market. If there are technical or other economies of scale, firms which do not grow with the market will be at a disadvantage. A motor company which produces 500,000 cars a year will be competitive in a market for 1,500,000 cars a year. It will be handicapped if it competes in a world market for 20 million cars with companies producing two million or more cars a year. Secondly, competition intensifies as barriers to trade are reduced, and in many industries competition focuses on the quality and novelty of products, so product development and improvement are key factors for the success of companies. Development costs have to be recovered from the sales of products to which they relate. A motor manufacturer which can sell 500,000 of a model a year is in a much stronger position to spend on development, than a company which can sell only 100,000 of a similar model.

The growth of markets has not only focused attention on product development, it has also speeded up developments. Generally there are limits to the extent of technical economies of scale as machines and processes have a finite capacity. In contrast, for many products expenditure on R & D is relatively unlimited, so the economies of scale through spreading these costs can extend over far greater outputs. As firms increase development expenditure the evolution of products speeds up. For many lines of business, product lives are less than ten years. In the 1980's a company which develops a new, or improved product, is likely to have less time in which to build its market position before competitors produce rival products than was the case in the 1960s. This increases the advantage of an existing giant international company which has knowledge of, and access to, world markets.

It is easy to claim that markets have expanded with the reductions in trade barriers. In reality the changes are complex. International differences in consumer tastes and preferences have not disappeared. Many products have to be adapted to the special features of demand and requirements in each country. To give an obvious example, air conditioning of cars is essential in some markets but not others. Also governments, companies and consumers favour suppliers in their own country for all sorts of reasons. Local suppliers may provide a more reliable service and, directly or indirectly, create demand for the products or services produced by their customers. In some countries nationalistic practices and sentiment may be stronger than in other countries and such barriers to free markets are much more difficult to eliminate than tariff barriers. Again, the differences in national markets and preference for national firms provide giant multi-national companies with a potential source of advantage. They will be familiar with, and have experience of operating in, different markets. If they have manufacturing operations in a country, that may enable them to market imported products or components more readily.

There are two other effects of the increase in the size of markets. Firstly, firms can grow but still be disciplined by the market. Most giant industrial companies face intense competition in international markets. Secondly, the rewards for innovation as well as the costs of product development have increased. A company that can launch a new product - drug, machine, computer - on world markets obtains far greater sales and profits than a company limited to a small domestic market.

A possible argument to refute the importance of R & D might be that total expenditure on R & D is small in relation to total costs. For Germany, France, UK and Italy expenditure on R & D averages about two per cent of GDP. The percentage is larger for manufacturing - R & D expenditure represents six per cent of value added by UK manufacturing industry. However the main point is that these statistics underestimate the significance of product specific expenditure. Official estimates of R & D expenditure do not include much of the design and product specific marketing expenditure undertaken by firms. Nor do they include the loss of production when a new product is introduced.

Scale and Research and Development - The Evidence

If, as suggested, the spreading of research and development costs is an important source of economies of scale, there should be evidence to support the claim. The relationship between the size of companies and innovative activity has been studied intensively but the various dimensions of scale have not been clearly differentiated in much of this research.

There is some evidence that organized research and development activities do increase with the size of companies, large companies spend proportionally more on research and development and that R & D programmes are highly concentrated. Twenty firms account for about a half or more of R & D expenditure in each of the Western industrial countries. There is no evidence that the productivity of research expenditure increases with the scale of companies. Indeed the evidence, for what it is worth, points weakly in the other direction, towards diminishing productivity. However, the studies are not conclusive because of the difficulty of measuring the output from research and development effort. The main measures which are used by respected scholars are numbers of significant technological innovations achieved and the numbers of patents obtained. Both are seriously flawed as measures of output. The value of individual innovations and patents varies greatly. Also the measures do not provide a guide to the use companies are able to make of innovations or patents; a principal advantage of a giant company may lie in its ability to fully exploit an invention. Even more important is the fact that much development expenditure (perhaps more than half of all expenditure) is not aimed to create innovations or patents but to develop improved products with known technology. In any case, the result that R & D expenditure and the effectiveness of R & D is not closely related to the size of companies would not be surprising when the analysis relates to all companies. 'The major source of variations in research intensity between firms is the industry concerned'.[1] Some large companies, including large motor car manufacturers which spend heavily on R & D, are not searching for new products. Much, if not all, of their R & D is devoted to improving their existing products. Many small firms are set up to exploit ideas for new products, and the proprietors of many small firms are continuously searching for ideas for new products and markets.

The estimates of the effects of spreading development costs included in Section 5 relate to individual products and narrow ranges of products. Research to assess the relationship between scale and research and development expenditure at this level of disaggregation are scarce. Research at an industry group level suggests that in some trades small firms do contribute to innovation. These include machinery, instruments, electronics, clothing and footwear.[2] The safest conclusion is that existing research does not provide conclusive results on the advantages of large companies for research and development. It does not disprove the common sense notion that a

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(1) F.M. Scherer in 'Innovation and Growth - Schumpeterian Perspectives', MIT Press, Cambridge, USA, 1984, C. Freeman in 'The Economies of Industrial Innovation', London 1982 and Kamien and Schwartz in 'Market Structure and Innovation', Cambridge, 1982, report the state of research on the relationship between corporate size and innovative activity.

(2) C. Freeman, 'The Economics of Industrial Innovation', London, 1982.

company with a larger share of a market than its rivals for a technically sophisticated product has an important though not necessarily decisive source of advantage in being able to spread research and development costs over a larger output.(1)

Research and Development and Completion of the EC.

Completion of the EC will provide a number of opportunities for economies of scale for research and development. The principal source will be for firms to spread product specific development costs over larger output of products and/or to speed up development. These economies were included in Section 5. In addition as larger firms emerge within the EC there will be potential economies from reducing duplication of both research and development which will make it possible to use R & D resources more efficiently. As R & D personnel are one of the principal scarce resources for creating new industry and jobs in the EC this increased efficiency would be doubly significant as it would release resources which could have a multiplier effect on employment elsewhere.

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(1) F.M. Scherer in 'Innovation and Growth - Schumpeterian Perspectives', MIT Press, Cambridge, USA, 1984 and C. Freeman in 'The Economies of Industrial Innovation', London 1982, report state of research on the relationship between corporate size and innovative activity.

RISK TAKING AND THE COST OF FINANCE

The advantages of a large company with a large share of a market for development are not only the greater resources at its disposal and its scope for employing more specialists. Within large companies development work is carried out by teams of scientists, engineers and craftsmen, and the teams are often quite small. The increasing importance and pace of development has increased risks. While it is true that an entrepreneur managing a small firm may be willing to take immense risks because he is particularly knowledgeable and in a position to assess the chances of success, or, in some cases, because he is simply unaware of the risk; large companies do have advantages in risk taking. Firstly, they can spread their risks; they can take on a number of projects and if some fail, or absorb more resources than expected, this need not jeopardise the future of a large company. This advantage of large companies reflects a market failure. Development of new products is risky but it is not possible for a firm concentrating on one or a small range of new products to insure to cover these risks. Another source of advantage is that a large company may have access to more information about technology, markets, and strategies of rivals when deciding whether to take on a project.

Riskiness and the cost of finance are related. A large company which can spread its resources over a number of individually risky projects may expect to be able to obtain finance at a lower cost. Its shares may trade at a lower yield on the stock market, and it will pay a lower rate of interest for loans. The difference in interest rates for the smallest and giant companies is about four per cent.

The fact that the shares of many small hi-tech companies are on very low dividend yields does not wholly disprove the link between equity yields and size of companies. Clearly investors may achieve a spread of risks by buying shares in a range of small companies. However, the problem for small companies is the availability, and very high cost of finance when they encounter a crisis. A large company with diversified risks may be able to carry a few failures, and is able to move resources within the group. This difference may reflect another market failure. The top managers of a large company may be able to assess the possibilities for recovery of one of its operating businesses more accurately than independent shareholders or financiers assessing the prospects for a small company beset by a crisis. The top managers of a large company will have more information than the independent shareholders of a small company when taking decisions.

The advantage of small firms for risk taking is that their managers are under greater pressure to make the right decisions about which options to take. Also the managers taking decisions may have better information, for example, they may themselves deal with customers and be familiar with production and development.

MANAGEMENT

Economists have long seen management as the main source of diseconomies of scale and the limitation on the optimum scale of firms. For example, EAG Robinson concluded the 'problems of management in certain contexts set an upper limit to the optimum size of the closely integrated production unit.'[(1)] Scherer states boldly that 'it is much

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(1) E.A.G. Robinson 'The Structure of Competitive Industry', Cambridge, 1958, p. 49.

harder to manage a big plant than a small one, all else being equal'.[1] Peters and Waterman have claimed that 'the excellent companies understand that beyond a certain surprisingly small size, diseconomies of scale seem to set in with a vengeance'.[2] The source of diseconomies they describe are problems of management, organising operations and motivating employees.

Robinson stresses the inter action between 'change' and management. 'If change is not required, I should not be inclined to stress the difficulties of managing the very large resulting concern, so long as it remains engaged in continuous and unvaried production'. Again cement plants provide an example of unvaried production, though they have to contend with varying demand. The argument of this section has been that the pace of change and in particular the rate of evolution of many products has increased, reinforcing the importance of management. The stress placed on the 'management of change' in management schools and literature show that the problems are recognised.

O.E. Williamson has analysed management relationships in a series of major studies, and provides case studies to illustrate his theoretical analysis.[3] So far, however, it has not been possible to quantify the relationships between scale and the costs and effectiveness of management, and specify an MES scale of management. In part this

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(1) F.S. Scherer, 'Industrial Market Structure and Economic Performance', Chicago, 1980, p. 85.

(2) T.J. Peters and R.H. Waterman, 'In Search of Excellence', New York, 1981, p. 112.

(3) O.E. Williamson, 'Corporate Control and Business Behaviour', Englewood Cliffs, 1970 and 'Markets and Hierarchies', 1975.

reflects the fact that the ability of individual managers to manage large organisations varies, the ease of managing different types of operations varies and there may be international differences in the difficulty of managing large organisations. The competitiveness of some giant companies such as IBM, Toyota, Boeing, Siemens, etc shows that the problems of managing very large organisations and motivating employees of large organisations are surmountable.

ACCOUNTING RATES OF RETURN

If large companies have general advantages and benefit from economies of scale, it might be expected that rates of return on assets would be positively related to size. There are all sorts of qualifications to using such tests. Large and small companies operate in different trades and/or may produce different products if they are in the same trade. They may pay different prices for factors of production and there may be differences in the accounting methods companies use systematically related to the size of companies.

For what they are worth, studies indicate that for US companies, rates of return on assets are positively related to scale measured by total assets but that the relationship is a weak one[1]. For the UK, the results of tests indicate a negative relationship but 'it is unlikely that size will have an appreciable influence on ... profitability'.[2]

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(1) G.L. Salomon, 'Accounting Rates of Return', American Economic Review, 1985, p. 495.

(2) A. Singh and G. Whittington, 'Growth, Profitability and Valuation, Cambridge, 1968, p. 67.

CONCLUSIONS ON ECONOMIES OF SCALE FOR FIRMS

The a priori analysis and the review of evidence of the economies of scale for firms given in this section and the studies of company profits do not lead to any simple rules such as "the bigger the better" or "small firms are best". Nevertheless a range of potential sources of economies of scale for firms is identified. This suggests that in manufacturing trades where all the leading EC companies have lower output than their Japanese and US counterparts this must be a prima facie cause for concern.

Section 7. Other Evidence on the Economies of Scale

Ideally economists would measure the contribution of economies of scale to productivity and growth as accurately as scientists measure physical forces. That is not at present possible; assessing the contribution of economic forces is more akin to the practice of lawyers sifting evidence. Fortunately there is a wide range of evidence which corroberates the 'engineering' estimates indicating large economies of scale.

International Comparisons

Productivity in the US

Trade 7.1 shows two comparisons of output per person in manufacturing industries for the US and European countries. Both comparisons were made by the National Institute of Economic Research which has made thorough studies of international differences in labour productivity. The Institute claimed that the first column 'extracted from the many in the papers (in their special productivity issue) can perhaps be taken as indicative of the central findings'. The tables referred to showed estimates of output per person based on PPP. The National Institute has also made some comparisons of output per person for certain industries based upon measures of physical output. The second column shows an up-dated comparison.

Labour productivity for manufacturing industries is shown to be 50 percent higher in the US than in Germany in 1986. It may be that this estimate exaggerates the difference in productivity because insufficient allowance is made for the high quality of German products.(1) Also the much higher US productivity is not consistent with its weak international trade performance for manufactures. Indeed the weak export performance of some US industries, including steel (compared to Japanese firms), motors (compared to Japanese and European car and truck manufacturers) and telecommunications (compared to some European producers of telecommunications equipment) in which, circa 1960, the leading US companies were far larger than their international rivals cautions against exaggerating the significance of economies of scale compared to other factors, wage levels, efficiency, technical progress, design and quality, which affect international competitiveness. Nevertheless US productivity is higher than the German level and it seems unlikely that differences in education and training account for the difference because German standards of education and particularly industrial training are reckoned to be high relative to other countries. Nor do differences in investment account for the difference in labour productivity. The main potential economic explanation is the advantage the US still obtains from its larger fully integrated market via economies of scale. The evidence does suggest that the scale of US firms, plants and outputs of products are greater than in Germany for most though not all industries. A knowledgeable American industrial economist suggested that an alternative explanation to America benefiting from greater economies of scale. He claimed that American

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(1) It is difficult to make international comparisons of productivity for Germany's important mechanical engineering industry because of its wide range of specialised products.

workers, on average, work harder than their German counterparts.(1)

Table 7.1 International Comparisons of Labour Productivity for Manufacturing Industry for 1980 and 1986

	Output per employee 1980	Output per hour 1986
USA	100	100
Germany	50-59	67
France	60-65	69
Italy	50-54	58
U.K.	33-36	37
Belgium	60-65	58
Netherlands	76-83	77
Japan		66

Source: National Institute Review August, 1982, p. 11, and May, 1987, p. 73.

Japanese Competition

The source of the most severe competition for some important European industries is Japan. Again the Japanese market is much larger than any single European national market. Japanese manufacturing industries seem intensively competitive. There are a significant number of Japanese firms competing in most markets. Generally there are more firms producing each group of products than in any one European country but far fewer than in Europe as a whole. The international competition

(1) In 1960 Professor Jenkes suggested the same possible explanation for differences in productivity between America and Europe. E.A.G. Robinson, ed., 'Economic Consequences of the Size of Nations', London, 1960, p. 342.

for European firms generally comes from large Japanese firms. Even in industries where some of the Japanese competitors are smaller firms as in mechanical engineering, they are often supported by the giant 'Zaibatus', and their exports are channelled through trading houses.

The mainspring of Japanese industrial competitiveness has been the rapid assimilation of technical advances into products and for production processes. Another feature of Japanese competitiveness is that it is spearheaded by a small group of products for which there is a mass market. In 1986 cars accounted for 16 per cent of Japanese exports to the UK; trucks and vans, two per cent; parts for cars, trucks and vans, three per cent; motor cycles, one per cent; colour t.vs, one per cent, video recorders, three per cent; radio equipment, two and a half per cent. For each of these products some Japanese firms have greater output than European producers. In recent years Japanese competition has been led by very large organisations including Japanese motor vehicle and electrical companies which through control of their large home market and their exports to overseas markets have much larger outputs of many products than their European rivals. The strength of Japanese competition corroberates claims that the economies of scale are substantial and significant for competition.

An expert on Japanese industrial policy suggested in discussion that MITI is now less concerned with economies of scale than in the earlier post-war period. Earlier policies for concentrating the steel and motor industries had operated. MITI's more relaxed attitude towards economies of scale reflects the fact that Japanese firms in many industries are now among the largest in the world. The reduction in trade barriers has given Japanese firms access to world markets. In the 1980s MITI recognises the importance of fierce inter firm competition. Recent changes in exchange rates have led Japanese firms to adopt survival strategies. These strategies result in firms transferring some manufacturing operations overseas to take advantage of wages lower than those in Japan. These moves reduce the scale of some manufacturing operations in Japan.

Sweden & Switzerland

Sweden and Switzerland, two smaller European countries, have achieved high levels of labour productivity and output per head of population by world standards. Superficially their success conflicts with the evidence for the existence of large economies of scale. In fact, Sweden's industrial performance supports the view that there are large economies of scale. Since the development of the Swedish Match Corporation in the C19th, Swedish industrialists have been aware of the economic handicap imposed by the relatively limited size of their domestic market, and the opportunities available through exports and foreign investment to compensate for this. SKF, Alfa Laval, Atlas Copco, Ericsson, Sandvik and Electrolux are international companies which have reaped economies of scale at their Swedish plants through control of overseas markets by investing in other countries particularly the major industrial countries. Foreign investment has also played an important role in the development of Swiss manufacturing industry.

Again there are alternative explanations of Swedish and Swiss industrial competitiveness. The high quality of education and industrial training contribute to this.

Corporate Strategies and Practices

Take overs

The strategies adopted by companies are generally consistent with the view that economies of scale in manufacturing industries are substantial and that the costs and effectiveness of administration and management do not necessarily rise with horizontal increases in scale. Throughout the post-war period there have been waves of horizontal, conglomerate and cross border mergers and takeovers. There are alternative explanations for these takeovers but they are consistent with management perceiving scope for achieving economies of scale through growth by take overs.(1)

If it could be shown that mergers generally led to increases in efficiency that would provide further support for the theme that scale economies are large. In fact the results of studies of post-merger performance are not clear cut. Many reviews have been made of these studies and it is outside the scope of this report to delve into this muddy area of applied economies.(2) One piece of information the author of this report can add is, however, relevant to this review. Many of the studies of post-merger performance have used UK data from published accounts. These studies distinguished horizontal and conglomerate mergers, where horizontal mergers were defined as mergers between companies within the same industrial group or branch of manufacturing

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(1) The alternative explanations are that management want to take over competing firms to eliminate competition or simply to control more assets.

(2) The most recent review is by Brian Chiplin and Mike Wright, 'The Logic of Mergers', Hobart Paper 107, London. 1985.

industry. This is a very broad definition; it means that two firms making any food products which merge are considered a horizontal merger. The same definition was used in a recent American study of post-merger profitability. The author made a survey of these so-called horizontal mergers in the UK and found that only about ten per cent were between companies for which there would be substantial scope for obtaining any technical economies of scale in production or for spreading the development costs of products. In 90 per cent of cases the products made by the merging companies were too distinct. Thus, even if average post merger profitability for widely defined horizontal mergers does not increase this is not evidence that there are no economies of scale for products.

Sourcing components

Vehicle and other companies generally source (buy) each component from one or a very small number of suppliers. Many companies recognise that single sourcing provides lowest costs via economies of scale. The main reason for dual sourcing where it occurs is to secure alternative supplies and/or to provide a check on quality and prices.

Rationalization

Particularly during recessions, firms rationalise their production facilities. Firms rationalize their production facilities because they develop or acquire excess capacity, intensified competition or because they reckon they will cut costs and increase their profits. Although the author is not aware of any comparative studies of rationalisation, the pattern of most schemes is to concentrate production. There is no evidence that when firms are faced with a need to cut costs they rarely divide production.(1) This suggests that there are no effective managerial diseconomies of scale for increasing production of a limited range of products at an establishment.

Focusing Businesses

A fashionable management practice during the 1980s has been for large companies, especially large UK companies, to focus their activities on a small number of businesses in which they consider they have, or can achieve a competitive advantage. To achieve the focus, other activities are sold off and the businesses retained are often expanded by acquisitions. This practice is consistent with the existence of economies of scale. There are of course, other possible motives for the practice such as achieving large market shares for their monopoly advantages.

Another feature of management practice is to delegate management responsibility for distinct activities. This suggests there are management or other diseconomies of scale for bundling together under a single operational management, activities of a distinct nature.

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(1) A recent example of a move to divide production was General Motors' decision to give its US car divisions greater control over their supply of components. Previously component production had been highly concentrated to take advantage of the economies of scale. In recent years these economies of scale had been offset by the higher wages per man paid by General Motors at its component manufacturing units compared to the wages paid by independent component manufacturers.

The important point suggested by corporate strategies and practices is that the costs and effectiveness of management does not impose increasing costs as horizontal scale is increased.

The use of Census Data to estimate the MES and the Economies of Scale

Lyons

Bruce Lyons has proposed a neat method of estimating the minimum efficient scale of production.[1] In effect he argues that if a firm operates more than one plant then its output exceeds the minimum efficient scale of a plant. From a distribution of the number of plants operated by firms in size groups, he estimated the minimum efficient scale of production for plants.

Lyons recognised that there are qualifications to his method of estimating the MES for multi-product industries. Firms may operate more than one plant because they make a number of distinct products not because they have exhausted the economies of scale for any one product. All census trades are multi-product trades. Nevertheless Lyons' estimates are of interest because they draw attention to the great number of small plants. He analysed 118 trades. For 105 trades his estimate of the MES was below 250 employees, for ten it was between 250 and 500, for one it was between 500 and 1,000 and for two trades it was above 1,000. Lyons' estimates indicate that many small plants are efficient, but his estimates are not inconsistent with there being technical economies of scale for large plants in segments of trades. For example, the existence of small plants making fasteners for cars or

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(1) Bruce Lyons, 'A New Measure of Minimum Efficient Plant Size in U.K. Manufacturing Industry', Economica Feb. 1980.

replicas of vintage cars is not inconsistent with economies of scale for large factories at which standard cars are assembled.

Lyons acknowledged that his method provides estimates of the MES for only one dimension of scale, the size of plants. It does not estimate the economies of scale for products, production runs or firms.

Griliches & Ringsjad

The limitations to using Census data as a source for estimating the economies of scale are again illustrated by an elegant study made by Z. Griliches and V. Ringsjad.[(1)] Although their "principal finding is the evidence for increasing returns to scale ...", their estimates of scale coefficients imply generally small economies of scale for establishments in manufacturing and mining industries. This conclusion is reinforced by the fact that their study is based upon Norwegian data, and establishments in Norway are smaller than in the larger industrial countries. However, the results may not apply to industry in other countries Norwegian industry is concentrated on some industries for which economies of scale are limited, for example, food and fish processing and sawmills, where the manufacturing processes are relatively simple and the transport costs involved in concentrating production would be high. The Norwegian market is relatively small, so Norwegian firms have not developed industries, such as motor vehicles, requiring large scale.

Griliches and Ringsjad obtained their estimates of the economies of scale by fitting data for 5,361 individual establishments to a Cobb

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(1) 'Economies of Scale and the Form of the Production Function', Amsterdam, 1971. This study was up-dated by V. Ringsjad in the Swedish Journal of Economics Vol. 80, 1978, No. 3.

Douglas production function. Their tests show that the estimates of scale effects are not very sensitive to the specification of the production function. Their main measures of labour input are in terms of hours worked at prevailing wage rates and for fixed capital, insurances values.

The economic interpretation of a scale coefficient for data for establishments drawn from all of Norwegian manufacturing industry is not clear. In effect small businesses making, for example, bespoke products or breaking bulky consignments and repacking, are compared with paper mills making newsprint and bulk chemicals. One would expect approximate equality of value added per unit of (weighted) inputs across this spectrum. The scale coefficient perhaps measures the effects of the greater barriers to entry in the trades with large plants. On a more positive note, the estimates do indicate that large is not inevitably best. If large establishments were much more efficient than small ones whatever the combination of products produced in the large establishments, Norwegian industry would be organised with fewer small units and the scale coefficient would be larger.

The authors also provide estimates for individual industries. But many of these industries are amalgamations of different trades (subject to varying market conditions in 1963). For example, besides grouping pulp and paper mills together, small mills making high quality special papers are grouped with large mills making newsprint and packaging paper. The problems of comparing different kinds of business applies within many industries as well as to all manufacturing. The authors recognise this problem. They also recognise other sources of qualifications which may bias the results to an unquantifiable extent.(1).

Baldwin and Gorecki(2)

The attempt by Baldwin and Gorecki to measure the economies of scale from Canadian Census data is the most ambitious so far. They focus on the results obtained by fitting data for Canadian manufacturing establishments in 1979 to a Cobb Douglas production function. Again their results indicate that economies of scale apply. Their results indicate that the increase in unit costs for each halving in the size of establishments would be about ten per cent. They also fit data for each industry to a Cobb Douglas production function. The median result for estimates for individual industries also indicates that unit costs would rise by about ten per cent with each halving of scale. These results suggest larger economies of scale than the estimates made by Griliches and Ringsjad using Norwegian data. Their estimates indicated

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(1) The authors admit that 'there is a great deal of variability in their micro-data which is not explained by the variables at their command'. They say that the bias 'is just as likely to result in estimates that are too low as too high'. They do not examine the economic justification for this claim. Where large economies of scale exist small establishments will have been forced out of business or the value of their capital stock will have been lowered. (The use of insurance policy replacement values may not get around this problem of valuation because values may in part reflect expectations of profits. For example, a firm might not insure at full replacement value if it would not replace a small scale unit in the event of fire because a new plant would not be profitable at full replacement cost). The authors mention the likelihood that if economies of scale exist prices of the output of large establishments could be lower.

(2) John R. Baldwin and Paul K. Gorecki 'The Role of Scale in Canada-US Productivity Differences in the Manufacturing Sector', Toronto, 1986.

that costs would rise by about four per cent with each halving of scale. However both sets of estimates are qualified for the reasons outlined.

Baldwin and Gorecki give estimates of scale coefficients for industry groups in their Table 4.1. Industry groups were ranked according to the scale coefficients calculated for 1979. There was a weak correspondence with the ordering given in table 5.3(b); the rank correlation coefficient was 0.09. The Baldwin and Gorecki estimates showed clothing manufacture, knitting, leather and textiles to have low economies of scale, similar to the assessment based on industry studies. Chemicals were ranked fifth; printing, sixth; and paper, seventh. But tobacco was ranked first; non-metallic mineral goods, second; and food and beverages third, much higher positions than in Table 5.3(b) and machinery was lower at fifteenth. Apart from tobacco these industry groups include a very wide range of products. The estimated scale coefficients may reflect differences between sub sectors of these industry groups not the existence of economies of scale for firms making similar products.

Studies of Costs and Prices

Owen

Nicholas Owen has used price and cost data to check engineering estimates of the economies of scale for the car, truck and consumer durables industries.(1) Owen shows there was a decline in real costs per car through time as European car producers increased their output. The average reduction in costs was in line with the expected effects of

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(1) Nicholas Owen, 'Economies of Scale, Competitiveness, and Trade Patterns within the European Community', Oxford, 1983.

increasing scale based on engineering estimates of the economies of scale. However, the reduction in unit costs estimated by Owen was attributable to technical progress as well as scale increases. For the other industries Owen studied, cost data did not conflict with engineering estimates of the economies of scale.

Conclusions

International comparisons and the conduct of industrialists supports the view that there are economies of scale where scale is increased horizontally and that the costs and effectiveness of management do not impose a limit on these economies. The results of studies based on census data costs and prices certainly do not conflict with the existence of economies of scale, but the quantitative estimates produced by these methods are marred by serious qualifications.

Section 8. The Resurgence of Small Firms

Mrs. Thatcher's origins as the daughter of a one-shop grocer and her promotion of small and new businesses have drawn attention to the role of small businesses in Britain. Other reasons for the current emphasis on small businesses in Britain are that the small business sector accounted for relatively less output in Britain than in other developed industrial countries by the 1970s, and high levels of unemployment.

The extent to which small businesses in Britain have outperformed larger firms in terms of the growth of employment is, however, not settled. The collection of statistics for small businesses is not comprehensive and estimates of employment and changes of employment in small businesses are unreliable.(1) Nevertheless there is strong evidence that small businesses in the USA are an important source, perhaps the main source, of net new jobs in recent years and that the decline in the proportion of people who are self-employed has been reversed.(2)

The resurgence of, and emphasis on, small firms is common to the developed industrial countries. Superficially at least this trend counters the view that the economies of scale are large. In this section the paradox of the resurgence of small firms and the existence of large economies of scale is considered.

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(1) P.E. Hart, 'Job Generation and Size of Firms', National Institute of Economic and Social Research Discussion Paper No. 125.

(2) David M. Blau, 'A Time-Series Analysis of Self-Employment in the United States', Jnl. of Pol. Econ. June 1987. Blau refers to evidence of the reversal of the long-run declining trends in non-agricultural self-employment.

Technical Change

It is clear that in the many important industries including steel, automobiles, and engineering, technical developments such as the speeding up of processes, new techniques for shaping metal, the substitution of electronic for mechanical devices, the use of plastic instead of metal components and the introduction of computers and robots have greatly increased labour productivity. These changes have certainly reduced the number of employees required to produce a given output of many products. They have also reduced the MES of plants in many industries where the size of plants is measured in terms of numbers of employees, but this is an unsatisfactory measure in any case. These changes have not necessarily reduced the economies of scale for large outputs of products.

Technical change has worked in both directions. Numerical control of machine tools has reduced the cost penalty for producing repeated short batches of machined products and so reduced costs for firms which produce small batches. It has been argued that numerical control and computer aids for production also aid small firms because small firms are more flexible and have more informal management systems. In particular there is less polarization within small firms between operators and specialists such as programmers. The introduction and efficient use of numerical control and computer aids to production is facilitated by flexible working arrangements.[1] At the same time computer stock control systems, computer aided design, and the use of computers for production control have reduced the costs of small batch

(1) A. Sorge et al. 'Microelectronics and Manpower in Manufacturing'. Berlin, 1983.

production at large plants. For example, one of the handicaps of a large footwear factory producing a range of styles, sizes and fittings is the problems of organising production to fully utilize capacity. Computer systems provide firms with an important aid for organising such production efficiently.

Generally the substitution of plastic for metal components has reduced the economies of scale for products, but the substitution of plastic for leather and wood has tended to increase the economies of scale for producing large outputs of products because the quality of synthetic materials is more standardised and this facilitates cutting etc. Computer type setting has reduced the scale of operations required for type setting for books to the point where outworkers are used. On the other side, economies of scale for non-woven fabrics are generally greater than for woven fabrics which they are replacing. Also the manufacture of carpets by tufting in place of weaving has increased the economies of scale in that trade.

Faster Technical Development

The explosion in technical development has presented many opportunities for the invention of radically new products and processes. Many of these inventions have been pioneered by small and new firms. Throughout industrial history there has been a tendency for many existing and new firms to enter new industries. One relatively new source of advantage for some of the small firms in the engineering/electrical/instrument industries is that they have skilled staff who can develop efficient software to control the operation of the machines or instruments. This is critical for the development of many products in these trades. Of course, large firms have software experts and consultants can be hired, but shortages of these skills limit the range of products for which large firms compete and this leaves gaps for small firms to exploit. For some new products made by small firms the UK market alone is too small to achieve competitive scales of production. This applies to other EEC countries. The firms have to export into foreign markets to increase output and move along the scale curve for their products. The hand calculator and domestic computer markets provide obvious illustrations of this point. The UK market did not enable firms in these trades to achieve the scale necessary to reap sufficient economies of scale to be competitive with Japanese and American producers. In some segments of trades the domestic market is sufficient because, so far, foreign firms have not attempted to compete or domestic buyers, such as universities when buying instruments, prefer to buy locally.

Increase in the Output of Skilled Staff

Technical change may have worked in a different way. The merging of national markets and speeding up of technical change have combined to increase the value of the output of those employees who can affect the international competitiveness of firms. The return for developing and marketing new products is increased by the enlarged market to which the products can be sold, and increased competition in developing new and improved products puts pressure on firms to innovate and introduce more new products.

The output of skilled staff may have increased, but the pay structures of large companies are rather rigid and in many cases it is difficult for large firms to target increased pay to the staff responsible for new developments to fully reflect their contribution. Also large companies do not give their employees a major share of the property rights in the innovations they create. Skilled staff set up their own firms in order to identify and secure a higher proportion of their output. The incentive to do this has increased with the increase in the output of the skilled staff.

Economic Forces

The emphasis on small firms does not reflect technical developments alone. Demand for the products of the motor vehicle and domestic appliance industries which are dominated by large firms and economies of scale have reached maturity in European countries. The slowing growth of these industries has been further depressed by intensified international competition. In part the focus on small and new firms is to replace the growth of these mature industries.

Another development which has transferred employment from large to small firms is the move by many large companies to focus their business and operations on products and processes for which they have a competitive advantage. One aspect of this process is to buy out services and manufacturing operations from other firms instead of performing the services in-house. This trend has been reinforced by the perceived need of managers to increase flexibility to meet fluctuations in total demand and changes in demand for products. Also the recession circa 1980 led managers to search for ways of reducing costs, and buying out reduces overhead costs such as commitments for pensions and may free firms from labour restrictive practices and wage and other agreements with trade unions. The increasing importance of information or knowledge services for firms may have led them to look for more efficient ways of procuring the services. Earlier hiring experts as full-time employees was not too expensive. Now with the increase in the relative salaries and the proliferation of the expert services a company requires because of faster technical progress and the integration of national markets, it is important to hire experts in the most efficient way, which may be from an independent business. In this way fluctuations in demand for experts from individual firms through time may be evened out and expert knowledge may be selected for tasks more precisely. Finally once a market for firms supplying expert services develops, the firms supplying the expertise may have the advantage of wider experience than the internal experts of firms. Increases in unemployment have weakened the bargaining position of trade unions, but the wages paid by most firms have continued to rise. Buying out services may in effect enable firms to reduce wages because the employees of the firms from which goods or services are bought pay lower wages.

Examples abound; many companies buy out computer software and the services of consultants, instead of employing specialised staff, and at a more mundane level use contract cleaners instead of employing cleaners. Some firms have also increased the manufacturing operations they buy out. Firms now buy out steel, castings, and machining operations which earlier they made or performed in-house. These trends have certainly opened opportunities for many small, new and specialised firms. They do not, however, reduce the real economies of scale for products.

The growth of international trade has changed the competitiveness of both small and large firms. Perhaps the main advantage for small scale firms in manufacturing industries from the growth of trade is that they can buy components from suppliers in other countries. This often takes away the scale advantage of larger domestic manufacturers who could make the components in-house on a large scale. The small firms use the scale advantage or low costs of suppliers in other countries. On the other side only large firms with an international marketing network may be able to gain a large enough share of world markets for a new product to be competitive. But again a small firm may be able to market its products in other countries in collaboration with a large company with an international sales network.

The 'Cambridge Phenomenon'

The technical and economic forces listed have contributed to the mushroom growth of small firms in the Cambridge area since 1970. Many of the firms provide consultancy services; firms which make hardware buy out components from the UK suppliers and buy many important components overseas. The new products and services they supply to niche markets result from technological developments. These rather obvious points are listed because they lead to another explanation for the 'Cambridge Phenomenon' which has been given wide publicity. Success leads to success. Employees of small and new firms serving niche markets learn how it is done and themselves set up new firms. An infrastructure of firms supplying the new firms with a great range of services and finance emerges and facilitates the growth of more new firms. 'Agglomeration economies no longer result from manufacturing in a single industry such as cotton or steel, but relate to the output of a highly skilled research, development and production-oriented workforce that can adapt to totally new technical innovations and production concepts'.(1)

Purchases of a Leading UK Manufacturing Company.

To check on the conclusions of this section the director of a leading UK manufacturing company responsible for buying was asked if he had noted any shift towards buying from smaller firms. He answered with the comments

> 'There has not been any detectable transfer of business from large companies to small ones, but some of the new products such as software and consultancy are bought from very small organisations'.
>
> 'The company has been following a policy of supplier reduction. The idea is that a smaller number of companies enjoying higher volumes will be better able to afford the research and development, the investment and the introduction of new production and management systems that are necessary to meet our quality and productivity objectives'.
>
> 'So, alongside the industrial giants we have always done business with, are hundreds of companies with employment levels measured in hundreds and sometimes tens. These small companies are more numerous in the provision of services to our offices and factories, such as cleaning, construction maintenance and low volume quick service engineering products'.

Conclusion

In brief, the resurgence of small firms is not evidence that the economies of scale have disappeared or even diminished. For the most part the estimates of economies of scale for technical and development costs given in Section 5 stand. New and small firms have not made

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(1) R. Oakey, 'High Technology and Small Firms' London, 1984.

inroads into the markets for cars, advanced aeroplanes, tractors, or combines. They have developed some new products and have found some niches in markets.

Section 9. The Community's Exports of Manufactures and the Economies of Scale

In this section the pattern of the EC's export trade is related to the estimates of the economies of scale reported in this survey.

Table 9.1 records the distribution of value added, production and exports by EC manufacturing industries. The final column of the table shows the ordering of industry groups according to the magnitude of economies of scale developed in Table 5.3(b). The ordering is intended to give a general indicator of the importance of the economies of scale for industries.

The unweighted average indicator of scale for industry groups is 10.5. When value added by industry is used as weights for the economies of scale indicator, the average is 8.8. This variation from the unweighted average is explained by some of the industry groups such as leather and leather goods with relatively small economies of scale having relatively small output. Motor vehicles for which scale economies are largest has a larger than average weight.

The weighting by exports is more interesting. When the scale indicators are weighted by 'Extra Community Exports', exports to countries outside the community, the average falls from 8.8 to 7.4. For 'Intra Community Exports' the weighted average was 7.8. Another statistic used to illustrate the relationship between the variables included in Table 9.1 is the rank correlation coefficient. The rank correlation between extra community exports and scale, 0.64, is shown to be closer than that between value added and scale, 0.47.[1] The

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(1) The industry with the greatest value added is ranked 1, the industry with the second greatest value added is ranked 2 and so on.

Table 9.1 EUR 10 Exports and the Economies of Scale

Industry	Percentage Share of Industries in Value Added (1980) (1)	Percentage Share of Industries in Production Value (1980) (2)	Extra Community Exports as Percentage of Total (1983) (3)	Share of Extra Community Exports as Percentage Share of Community Production Value (4)	Intra Community Exports as Percentage of Total (1983) (5)	Share of Intra Community Exports as Percentage of Share of Community Production Value (6)	Indicator of Economies of Scale (7)
Mineral oil refining	2.7	8.3	3.4	41	8.5	102	3
Production and preliminary processing of metals	5.7	7.2	7.5	104	7.7	107	5
Iron and Steel	3.2	3.9	2.9	74	3.3	85	
Non-metallic mineral products	5.0	3.9	2.4	62	2.2	56	11
Concrete, cement, plaster products for construction	1.2	1.0	0.2	20	0.1	10	
Glass and glassware	1.2	0.9	0.7	78	0.8	89	
Chemicals and man-made fibres	9.7	10.2	12.7	125	13.5	132	3
Basic Industrial Chemicals	4.3	5.2	6.3	121	7.7	148	
Pharmaceutical products	2.0	1.6	1.8	113	1.0	63	
Metal articles	8.3	6.7	4.8	72	3.1	46	12
Tools and finished metal goods	2.9	2.4	1.7	71	1.7	71	
Mechanical Engineering	10.9	8.6	17.0	198	8.2	95	7
Machine tools for working metal	1.4	0.9	1.7	189	0.7	78	
Plant for mines, iron and steel, etc.	1.9	1.8	2.9	161	1.3	72	
Office and data-processing equipment	1.5	1.0	1.9	190	3.0	300	6
Electrical Engineering	11.2	8.3	9.8	118	7.2	87	8
Electrical machinery	3.4	2.5	2.5	100	1.3	52	
Telecommunications equipment etc.	3.5	2.2	3.4	153	2.1	96	
Radio, television, etc.	1.6	1.4	1.2	86	1.4	100	
Domestic type electrical appliances	0.9	0.9	0.6	67	1.0	111	
Motor vehicles	8.7	8.0	10.6	133	10.9	136	1
Other means of transport	3.5	2.8	4.2	150	2.4	86	2
Shipbuilding	0.9	0.7	1.5	64	0.3	43	
Aerospace equipment manufacturing and repairs	2.0	1.5	2.2	147	1.7	113	
Instrument engineering	1.4	1.0	1.9	190	1.4	140	9
Food drink and tobacco	9.6	15.0	7.0	47	11.0	73	15
Textiles	4.0	3.7	3.4	92	5.3	143	17
Leather and leather goods	0.4	0.4	0.5	125	0.5	125	19
Mass-produced footwear	0.8	0.6	0.9	150	1.1	183	19
Ready-made clothing	2.1	1.8	1.2	67	1.7	94	19
Timber and wooden furniture	3.1	2.9	1.4	48	1.7	59	18
Pulp, paper and paper products	2.5	2.5	1.1	44	2.2	88	10
Printing	3.0	2.2	0.8	36	0.7	32	10
Rubber products	1.6	1.2	1.0	83	1.2	100	13
Plastic Products	2.2	2.0	1.5	75	2.2	110	13
Weighted average for the indicator of scale for industry groups	8.8		7.4		7.8		Unweighted 10.5
Rank correlation coefficient with column 7	0.46	0.47	0.64	0.16	0.61	0.11	

Source: 'Eurostat Yearbook of Industrial Statistics, 1984'.

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correlation between the magnitude of value added and the economies of scale indicator, again shows that the large manufacturing industries tend to have larger than average economies of scale. The rank correlation coefficient is higher for both extra and intra Community exports than for value added. The share of community exports is taken as a percentage of the share of production value for each industry in columns (4) and (6) to eliminate the effects of large industries tending to have larger than average economies of scale. Columns (4) and (6) indicate the export intensity of industries. The rank correlation for extra community exports and economies of scale of 0.16, and for intra community exports and economies of scale of 0.11, indicate the extent of the concentration of EC exports from industries with larger than average economies of scale.

The results are in the direction expected. The Community tends to export relatively more of products for which the economies of scale are relatively large. However the result for extra EC exports is very weak and is not as decisive as the author expected. There are several explanations:

1. The extra and particularly intra Community exports of food and textiles for which economies of scale are modest are substantial relative to the contribution of the industries making these products to value added. One explanation for the large trade in these products is the wide variety of products. The contribution of vehicles, chemicals and mechanical engineering - the industries with large economies of scale - to exports is greater than their share of value added but the difference in weighting is not very great.

2. The results reflect in part the failure of EC electronic industries. The share of electrical engineering exports is less than for its share of value added. Japanese and US companies have benefited from economies of scale in these industries.

3. The weighting may understate the relationship between exports and scale economies because within each industry group exports may be concentrated upon products for which economies of scale are greater than average for the industry group.

The fact that EC exports are not more heavily concentrated on industries with large economies of scale could be explained in another way. Trade is created by differences in products produced in different countries to satisfy consumers' quest for variety and change and/or differences in efficiency. Exports originate from efficient producers and reduce the output of inefficient firms. Either way there are gains from trade.

Section 10. Economies of Scale for the Service Sector

Estimates of the economies of scale for the service sector are scarce. This reflects the difficulty of making such estimates and, possibly, that economies of scale for service trades are lower than for manufacturing industries.

Methods of Measuring Economies of Scale for Services

The methods of measuring economies of scale which apply to manufactures can be used for services, but the engineering method is less reliable for services. The industrial processes used in manufacturing trades for which engineering estimates are made do have counterparts in the service trades. The aeroplanes used by an air line or the computer systems used by a bank spring to mind. But for many service trades capital equipment comes in quite small units relative to national output. The largest hotel, shop or retail banking premises is small relative to the national markets in which they operate. This replication of units doing the same kind of business means that comparisons of actual cost for units of varying size is a possible method of estimating economies of scale for some services. However, because there is much replication within national markets, the scope for economies of scale through completion of the EC is likely to be limited in these trades.

Sources of Economies of Scale for Services

Completion of the market will have two sets of effects via the economies of scale for service trades. Firstly, for service trades in which trade between member countries increases, there will be scope for economies of scale. The second set of effects will be generated by the increase in income in the EC which will be caused by completion of the market and which will increase demand and output of the service and other industries. In this section, the service trades which will be affected by increased trade in services between member countries are considered first.

The groups of services which are distinguished in the UK balance of payments statistics are listed in Table 10.1. The first column of the table which shows UK exports in 1984 provides a rough and ready indicator of the importance of the headings. Financial and other services are a relatively important source of exports for the UK and so UK exports provide an exaggerated measure of these services for total Community exports.

In the second column an assessment of the impact of completion of the EC for trade in each group of services is attempted. The services directly affected by the completion of the EC are insurance, banking, trading and consultancy.

The final column of the table comments on the sources of economies of scale for each service. One general source of economies of scale will be that transactions and deals increase in size and lead to a reduction in costs because costs which are fixed or semi-fixed relative to the size of transactions and deals can be spread over a larger output. The broad picture is that there are economies of scale in providing services, but that they are perhaps not as great as for

Table 10.1 Trade in Services and the Sources of Economies of Scale

Services	UK exports 1984 £bn	Effects of Completion of the EC for trade in these services	Sources of Economies of Scale
Sea transport	3.2	The increase in trade within the EC is likely to have very limited effects.	There are economies of scale for using large ships and aircraft, and economies from fully utilizing the capacity of ports, airports and railway systems more intensively. Consumption of the market will generate more traffic and increase the density of traffic on routes.
Civil Aviation	3.0	There will be some increase in demand for these services as a result of completion of the EC because of the removal of customs barriers and in response to increases in trade, but removal of restrictions on air fares may be more important	
Travel	4.2		
Insurance	0.7		The main sources of economies of scale in these industries which may be exploited through completion of the EC are: 1. There are technical economies for large data and information processing systems. There may be some scope for spreading the costs of developing and using these systems. 2. There is scope for spreading costs of acquiring expertise and knowledge over increased throughputs. 3. Completion of the EC will increase the size of some transactions and deals. Some costs of providing services are specific and fixed or semi-fixed relative to the size of transactions. An advantage of larger organisations providing these services will be that they are able to cope with larger transactions and deals.
Banking	1.0		
Commodity traders	0.3	Increase in trade expected	
Export houses and other brokers	0.8		
Consultancy	1.2		
Telecommunications and postal	0.4	Increases in Community trade will increase demand for these services	The increase in trade will generate increased communications and will generate economies of scale through more intensive utilization of facilities.
Films and TV programmes	0.3	Not much affected by completion of the EC	There are large economies of scale through widening the audiences for films and TV programmes as many of the real costs of producing programmes are fixed.
Oil and gas	0.2		
Land Transport	0.1	Increase in Community trade will increase demand for these services	Little scope for economies of scale
Advertising	0.1	Increase in trade expected	As markets coalesce and industries rationalise there will be economies through spreading the costs of making adverts over larger outputs. There may be some increase in advertising.

2.144

Services	UK exports 1984 £bn	Effects of Completion of the EC for trade in these services	Extent of Economies of Scale
Royalties	0.9	Not much affected by completion of the EC.	The effects of scale economies not significant.
Other services provided by companies	1.9		
Education Courses	0.5		
Diplomats	0.6	Not affected by completion of the EC	
Personnel at US bases in the UK	0.4		

manufacturing. As noted earlier there are obvious limits to the size of lorries, aircraft, ships, hotels and shops. Increased business will be met by duplication of facilities. The structure of the service trades supports this conclusion. There are more firms and establishments providing most individual services than manufacturer plants or factories producing most individual products.

It is outside the scope of this report to consider the sources of economies of scale in other service trades, including retailing and other channels of distribution, which will be affected by the increase in income generated by completion of the EC. The main sources of economies here are in the scope for spreading fixed and semi-fixed costs, for example, the costs of public administration, from the increased density of traffic in the post and telecommunications services,[1] and for large transactions in the retail trade both for buying and selling.

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(1) An example of a semi fixed cost for the postal service is the cost of postmen. Delivery of more mail to each household would not increase costs proportionately.

THE EVIDENCE

Industry Studies:

Banking and Financial Institutions

Sources: P.M. Horvitz, 'Economies of Scale in Banking' in 'Private Financial Institutions', for the 'Commission on Money and Credit', Englewood Cliffs, N.J. 1963.

J. Pacolet and A. Verheirstraetan, 'Concentration and Economies of Scale in the Belgian Financial Sector', in A. Verheirstraeten ed., 'Competition and Regulation in Financial Markets', New York, 1981.

J. Johnston, 'Statistical Cost Analysis', New York and London, 1960. (Section 5. Building Societies and Life Assurance Companies).

The sources describe studies of costs and scale and provide evidence of economies of scale at least over certain ranges of scale, but there are qualifications to the conclusions. Apparent scale effects are often later shown to reflect differences in the type of businesses done by large and small banks. The qualifications relate to the dimensions of scale. For example, the extent to which banks obtain deposits from a branch network or in the wholesale money markets varies. In the USA some banks operate branches while others do not. Small branches of banks tend to be sited in isolated communities. The existence of higher costs for such branches may influence a comparison of costs for the size of branches. Also there are problems relating to the measurement of costs. Horvitz shows that large banks in the USA pay higher salaries than small banks. The costs of buildings vary greatly according to the price of property in each locality and large banks tend to have headquarters sited in the centre of large towns where property prices are high.

No general estimates of the MES or scale gradients have been published for financial institutions.

Air Transport

Sources: D. Sawers, 'The Trouble with Big Airlines' Financial Times, August 24th, 1987.

P. Forsyth, R. Hill and C. Trengove, 'Measuring Airline Efficiency', Fiscal Studies, February 1986.

The sources refer to estimates that show that an airline's costs are not affected by the size of its route network. The marketing advantage of a large network is to be able to offer more through journeys without passengers having to change airlines. There are economies associated with density of traffic; high density allows an airline to use large aircraft on a route, and large aircraft have lower operating costs per passenger seat mile. Also staff and facilities on the ground at terminals can be used more efficiently where traffic on a route is dense. Extensions to a route network will increase the density of traffic on the airline's existing network.

Studies of Labour Productivity

In Section 7 we claimed that higher labour productivity in the USA supports the argument that economies of scale apply in manufacturing trades. Unfortunately the measurement of labour productivity for service trades is even more hazardous than for manufacturing trades. For what they are worth, the National Institute's estimates of productivity differentials between America and Europe show a smaller gap for services than for manufacturers.[1] This is compatible with economies of scale being less important in service trades. But it is weak evidence only, as there are other possible explanations and the estimates are subject to a wide margin of error.

Conclusions on the Economies of Scale for Services

There are reasons for expecting the economies of scale for services to be less than for manufacturing and the evidence does not conflict with this assessment. Plainly every European country cannot make commercial aircraft, motor cars or many other manufactured products efficiently, but each country does have a range of banks, insurance companies, stock brokers, shops, hotels, etc. There are market niches where there may be economies of scale, for example, banks arranging large corporate deals and re-insurance markets, but these are exceptions. In addition, as completion of the EC raises income and output, there will be some economies of scale in the service trades stemming from larger transactions and the economies of scale related to the size of bank branches, etc.

(1) National Institute Economic Review, August, 1982 p. 29. The gap for services is about two-thirds that for manufactures.

Section 11. Conclusions

The Completion of the EC and the Economies of Scale

Completion of the EC will have three groups of effects via economies of scale. Where completion of the market results in substantial changes in the conditions of trade, for example, by changing the rules for public procurement, there will be direct effects on industries, inter country trade will increase, structural change will occur in the industries and firms will benefit from economies of scale. If the national electricity authorities open their tendering to all EC manufacturers of equipment, trade in generating equipment between member states will increase, some firms will increase their share of EC markets and will gain economies of scale for the development and manufacture of this equipment. These effects of completing the EC can only be assessed on a case by case basis.

The second effect of completion of the market will be the widespread reduction of impediments to trade, increasing trade in all sectors, causing structural change in industries and generating benefits from economies of scale. This result will be reinforced by the third effect of completion of the market which will be to increase the growth of income within the community through achieving economies of scale and through the pressure of more intense competition. The increase in Community income will increase demand, output and inter-community trade, leading to further gains through economies of scale.

For reasons given in this report, estimates of the economies of scale are elusive and many of the estimates which are available are hedged around with qualifications. Nevertheless the evidence reported in this paper does support the hypothesis that economies of scale are a widespread feature of manufacturing industries and to a lesser extent of service trades.

The important result of this survey is to focus attention on the effects of changes in output of distinct products and production runs on costs. Economies of scale are usually associated with the size of establishments and firms. This is too limited a view. The main effects of completion of the market will result from many firms being able to increase their output of particular products, without necessarily increasing the average output of their establishments. This survey shows that there are substantial scale effects for products and production runs to be obtained in a wide range of manufacturing industries. The sources of these economies are technical economies of scale for production processes and the spreading of product development costs over the output to which they relate.

The competitiveness of EC Industries

The second question concerning the effects of completion of the EC is the impact on competitiveness of EC industries in third markets. A conclusion of Section 5 was that economies of scale continue indefinitely for complex products made by the vehicle, mechanical and electrical engineering and instrument industries. These are important EC export industries. Completion of the market will facilitate the restructuring of firms in these industries so that they increase their output of products and increase their competitiveness.

In Section 6 the advantages of large firms for R & D were described. Completion of the market will lead to the emergence of larger firms which can reap these advantages and cut the duplication of R & D within the EC. More efficient use of R & D personnel could have a multiplier effect on employment through job creation because R & D personnel are scarce.

Industrial Distribution of the Effects

Column 1 of Table 11.1 lists the manufacturing industry groups in order of the importance of economies of scale as in Table 5.3(b). This classification was based upon economies of scale for production and development. A noteworthy feature of this ordering is that the industries most subject to the economies of scale are the most concentrated in terms of the share of output produced by the largest companies. The vehicles, chemical, man-made fibres, metals and office machinery industries are all highly concentrated. Mechanical engineering is not concentrated but that reflects the immense range of products produced by that industry. At the other end of the list other manufacturing, textiles, timber, furniture, clothing and footwear and leather goods are all fragmented in part because of the diversity of their products.

The fact that the industries subject to the largest economies of scale are the most concentrated suggests that economies of scale are more fully exploited in these industries. The car, truck and aircraft industries have re-structured within the EC to take advantage of the economies of scale. It therefore seems unlikely that the economies of scale effects of completion of the EC will be concentrated on industries subject to especially large economies of scale. The effects will be spread right across manufacturing industries and service trades. The exceptions where the economies of scale will be substantial are the industries affected by changes in public procurement policy and national regulation of markets. These trades are pinpointed in column 3 of Table 11.1.

Table 11.1 The Industrial Distribution of the Effects of Completion of the EC.

Industry Groups in order of importance of economies of scale for production and development	Scope for economies of scale for research and development	Effects via economies of scale of lifting non-tariff barriers to trade in the EC.
1. Motor Vehicles	Major source of economies	Moderate effects of standardising national regulations for cars.
2. Other Vehicles	ditto	Moderate effects of standardising regulations for other vehicles and for lifting national preferences for public sector purchases of vehicles. Large effects for concentration of defence equipment procurement within the EC.
3. Chemicals	Large chemical companies have advantages for research and development.	Small effects
4. Man-made fibres		
5. Metals	There are advantages for large companies for research and development but small firms can and do invent and develop new products particularly products for niche markets.	
6. Office machinery		
7. Mechanical engineering		
8. Electrical engineering		Substantial effects for lifting restrictions on public sector procurement of electricity generating, telecoms and broadcasting equipment. There would be substantial effects from EC procurement of defence equipment.
9. Instrument engineering		
10. Paper, printing and publishing	R & D not as important in these industries, though some new products and processes are introduced and R & D is important in certain segments of the industries.	Small effects
11. Non metallic mineral goods		

Industry Groups in order of importance of economies of scale for production and development	Scope for economies of scale for research and development	Effects via economies of scale of lifting non-tariff barriers to trade in the EC.
12. Metal goods		Small effects
13. Rubber and plastic products		
14. Drink and tobacco		Moderate effects for standardising regulations
15: Food		
16. Other manufacturing industries	R & D not as important in these industries, though some new products and processes are introduced, and R & D is important in certain segments of the industries.	
17. Textiles		
18. Timber and furniture		Small effects
19. Footwear and clothing		
20. Leather goods		

CHAPTER 3

Economies of Scale and Intra-Community trade

Joachim Schwalbach

Contents

Tables

I. Introduction

It has been argued that industrial plant sizes are on average larger in the United States than in Europe.[1] As a consequence, European plants are considered to be too small to realize all significant scale economies in production, suffering a competitive disadvantage with respect to their American counterparts. Several reasons have been mentioned to account for why plant sizes differ between nations:

> "For one, some markets my be too small to support even a single plant of minimum optimal scale. And if buyers and government policymakers prefer some diversity of supply sources, two or more independent plants may survive in small markets, each plant too small to enjoy all economies of scale. ...... Dynamics also matter. The smaller the market is for any given (positive) growth rate, the more time it takes to accumulate a demand increment sufficient to absorb the capacity of a lumpy new MOS plant. Also, in markets small relative to the minimum optimal scale, oligopoly is likely, and the resulting concern for pricing interdependence and strategic position can aggravate propensities toward investment in inefficiently small plants." (Scherer et al., 1975, pp. 92-93).

It was generally expected that with the creation of a European Common Market existing gaps between current and cost efficient

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[1] See Bain (1966) and Scherer et al. (1975), chapter 3.

plant sizes would diminish over time. If no tariff barriers hinder trade flows between national markets, producers choice of plant sizes are less limited, leading to an adjustment process towards larger plants and, consequently, toward a fuller exploitation of scale economies in production. If, in addition, most non-tariff barriers within the European Community can be removed, plant size differences between Europe and the United States should disappear, taking with it European cost disadvantages.

This study tests the hypothesis that the removal of trade barriers within the European Community had the effect of increasing plant sizes, enabling plants to realize all significant scale economies. The hypothesis will be tested by applying two very different data sets on a group of manufacturing industries for the Federal Republic of Germany and the United Kingdom. The study is organized as follows: Section II provides some background information on the development of trade and firm sizes within the European Communities. Sections III and IV explain the deviation of observed plant sizes and the minimum efficient sizes (MES) at different points in time. In Section III, engineering and cost estimates provide information on the MES and the elasticity of the average cost curve of selected product-lines. And in Section IV, alternative measures are employed for estimating MES on the four-digit industry level. Section V evaluates the main results and provides forecasts about the effects of further removals of trade barriers on the degree of cost efficient increase of plants.

II. Development of Intra-Community Trade and Firm Sizes

According to our hypothesis, we expect that the creation of a European internal market would increase intra-Community trade flows and, therefore, lead to an increase in plant and firm sizes in industries where there are significant unexploited scale economies.

Table 1 gives a first impression about intra- and extra-Community trade flows, summarizing import flows over time. Table 1 shows that since 1963, both intra- and extra-Community import flows have increased over time. A closer look at Table 1 also shows that, until about 1975, intra-Community imports were more intense than extra-Community imports. After 1975, extra-Community imports became more important in the majority of industries. By 1982, in only nine industries were intra-Community imports larger than extra-Community imports: metal, means of transportation, foods, textile, and paper industries. Jacquemin and Sapir (1987) analyzed the relative slowdown of intra-Community trade in detail and concluded that after the initial period of European integration (which spans from 1958 to about 1972 for the founding six member countries) the dynamics of intra-Community trade seems to have diminished particularly in consumer and investment goods industries partly because of industry-specific deficiencies as well as still existing non-tariff barriers within the European Common Market. The relative slowdown, instead, encouraged imports from the rest of the world.

With increasing overall trade flows we expect an increase in plant and firm sizes as well. Table 2 summarizes the data available to us and shows the development of average firm sizes in the European Community in selected two-digit NACE industries. Columns (1) and (2) in Table 2 show the average number of employees in European firms in the years 1975 and 1982, whereas column (3) shows the slope of the time trend in the period 1975 to 1982. Table 2 clearly demonstrates that there exists the expected tendency towards larger, less labor-intensive firms for nearly all industries. Tables 1 and 2 together, then, are jointly consistent with our basic hypothesis, although, of course, other factors may be at work.

III. Determinants of Plant Sizes on the Product-Line Level

In this section we test our hypothesis that scale economies and intra-Community trade flows can explain deviations of plant sizes from minimum efficient plant sizes (MES) by using data on the product-line level. The analysis relies on a regression model, similar to the one adopted by Scherer et al. (1975) and Müller and Owen (1985) in which the dependent variable is the deviation of the representative plant size from the MES. Independent variables are the cost increase associated with sub-MES plants and export/import intensities. The model can be specified as follows:

$$PSD_{it} = a_{0t} + a_{1t}\, MS_{it} + a_{2t}\, C_{it} + a_{3t}\, E_{it} - a_{4t}\, I_{it} + \mu_{it} \qquad (1)$$

where

PSD_{it} is the observed plant size deviation from MES, measured as the ratio of the average plant size and MES.

MS_{it} is the size of the product market, measured as the ratio of domestic production and MES.

C_{it} is the cost increase associated with one-third of MES output.

E_{it} is the export intensity, measured by 1+exports/domestic production.

I_{it} is the import intensity, measured by 1-imports/domestic consumption.

μ_{it} is the error term, reflecting all other factors which effect plant size deviations.

a_{0t}, ... ,a_{4t} are regression coefficients

Indices i represent product-lines and
t stands for the time periods.

Equation (1) shows the expected direction of causality. The bigger the market in relation to MES output, the bigger the representative plant size is, therefore, the smaller is the size deviation. Thus, we expect $a_1>0$. A steep unit cost curve might give rise to larger plants since there are considerable cost differences between small and large plants. Hence one would expect that in this case firms build larger plants and this would be reflected in a higher PSD-value. Thus, $a_2>0$. International trade can have various effects on the deviation of actual plant sizes from MES. Export opportunities extend the relevant market and might give firms the change to work off excess capacity and to add new capacity to its plants. A larger export share in a market might, therefore, lead to larger plant sizes and so to higher PSD values. Thus, $a_3>0$. Imports, on the other hand, intensify domestic competition and encourage firms to invest in larger, more efficient plants. This investment behavior might be expected in markets in which the required market share to operate a MES plant is high. As a result, one expects to observe a plant size increase if import shares are significantly high. Thus, $a_4<0$.

The hypothesis will be tested for the periods 1965 and 1982. While we expect $a_i>0$, $i=1,2,3$ and $a_4<0$ for both periods, we wish to test the additional hypothesis that the effect of trade on plant size has increased over time. Thus, $a_{it}<a_{it+1}$, $i=1,2,3$ and $a_{4t}>a_{4t+1}$, which means that we expect a more significant influence from exports and imports in 1982 than in 1965 due to increasing trade liberalization within the European Community.

The data sample consists of MES and unit costs curve estimates on a product-line level. Some of the estimates come from various published sources and were performed by scholars using engineering and cost analysis approaches. The rest were made exclusively for this study by using the same estimation method. The result is shown in Table 3. The estimates in Table 3 suggest that, in most industries, MES output as well as cost disadvantages of sub-MES plants have increased over time. Technological change is the main cause of increases in the minimum efficient plant size. New production processes led to both lower unit costs and an increase in plant sizes required to take full advantage of the cost reduction potential. The technological development of recent years appear to be most significant in product-lines like beer brewing and cement in which cost disadvantages by sub-MES plants are particularly intense.

The remaining data on domestic production, exports, and imports were gathered from statistical sources for 1965 and 1982 for the Federal Republic of Germany. For the United Kingdom data were only available for 1982.

Regression results

Table 4 summarizes the regression results for the Federal Republic of Germany (FRG) and the United Kingdom (UK). The usual statistical tests were performed. The functional form of the regression equation was tested by applying a Lagrange multiplier test suggested by Godfrey and Wickens (1981). Heteroskedasticity was not detected, but multicollinearity was observed to be severe between the import variable and all other independent variables in the 1982 German sample. The stepwise regression results will show the impact of collinearity on the estimated coefficients.

The results in Table 4 show that market size in the FRG has an increasingly positive effect on plant size development over time. The coefficients are statistically significant but their values are very small. Thus, the positive effect on market size on the choice of larger plant sizes is still limited, e.g. a 100 percent increase in market size would lead to an 0.07 percent increase in RSD only. For the UK, the results show the opposite sign but the coefficient is statistically not significant, therefore we should not attach too much importance to it. However, it is interesting to speculate on how a negative sign could be interpreted. One obvious possibility is that the extent of diseconomies of scale, which restrict the expansion of plants, are relatively important. Such diseconomies are often transportation costs which are particularly intense in product-lines like beer brewing and cement, and lead to a fragmentation of markets. Other causes of diseconomies of scale may be product variety since a large variety increases changeover costs and reduces lot-size economies in production thereby raising the unit cost curve. In the UK, the diseconomies of scale seem to be overcompensated by scale economies.

The cost gradient coefficients have the expected positive sign for the FRG, although they are not statistically significant. Thus they give only moderate support for the hypothesis that the steeper the unit cost curve, the greater the incentive is to build larger plants. For the UK, the hypothesis is not confirmed since the effect is not significant. This suggests that diseconomies of scale may be more important in the UK than in Germany and may, therefore, lead to smaller plant sizes.

The results in Table 4 show that international trade plays an important role in determining plant size deviations from cost efficient plant sizes. In particular, exports provide the opportunity to enlarge plants. The results are highly significant for the FRG in both periods and for the UK in 1982. For the FRG, the export coefficient is larger and shows stronger significance in 1982 than in 1965, which suggests that exports have become more important over time as a determinant of plant capacity decisions. In the UK, the plant size expansion effect from exports seems to be stronger than in the FRG. Imports, on the other hand, also had a positive effect on plant size development in both countries. This effect was not significant in 1965 in the FRG and in the UK, but it was significant for the FRG in 1982. The results also indicate that the aforementioned multicollinearity between the imports variable and the other variables is particularly severe for the German data in 1982 between imports and exports. In sum, the results on trade show quite clearly that exports and imports had a simultaneous positive effect on the creation of larger plants. This observation and the positive association between exports and imports support the theory of intra-industry trade which shows that increasing differentation of products and services increase intra-industry trade. This effect on trade is enhanced if, in addition, trade barriers are low.

IV. Determinants of Plant Sizes at the Industry Level

In this section, we explain the deviation of observed plant sizes from minimum efficient plant sizes at the four-digit industry level and therefore at a slightly more aggregate level than in Section III. With the analysis on the industry level we are able to set up a larger data base which provides the opportunity to test the stability of the regression results on the product-line level in Section III. This stability test is important since the results in Section III might be very sensitive to an increase in the number of observations. Furthermore, the industry analysis enables us to select a richer set of explanatory variables.

By moving to the industry level we sacrifice the quality of the MES estimates. Since MES estimates are not available for a large number of industries, we have to apply alternative measures of MES. Alternative measures have been proposed in the literature and empirical tests have shown that two measures in particular are good substitutes: the 'Top 50 percent' index and the 'Midpoint' plant size index.[2] The first index "......is found by moving down the plant size distribution starting with the largest plants, until enough plants have been included to encompass 50 percent of total industry employment or output. The average plant size of those plants which account for the top half of the cumulative employment or output size distribution is then calculated." The other index ".... estimates the

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[2] See Scherer et al. (1975), chapter 3.

employment or output of that individual plant which is located at the 50 percent point of the cumulative size distribution." (Scherer et al., 1975, p.66).

With the two alternative MES measures at hand we are able to provide a first look at the plant size deviation from MES and its development over time at the industry level. For this purpose we grouped 102 German four-digit industries into its corresponding 16 two-digit NACE industries for the time period 1979-1985. The ratio between average plant size and MES will show whether plants are large enough to realize all scale economies and how plant sizes developed over time relative to the MES. Table 5 summarizes the calculated average ratio of average plant size to MES for the years 1979 and 1985, where the average plant size is measured in terms of the number of employees and the MES is represented by the TOP 50 percent index of total industry employees. The first impression we get from Table 5 is that actual plants are on average smaller than MES. In 1979, for instance, plants in the mineral oil refining industry are on average only 40 percent of MES and in 1985 about 60 percent. The deviation across industries varies which means that in the chemical industry we observe the largest deviation from efficient plant sizes while in the extraction of minerals industry the average plant is close to a cost efficient plant. Table 5 also shows that in 1985 plants on average exceeded the MES in two industries, namely in the extraction of minerals and the motor vehicles industries. In 1985 plants in these industries reached a cost efficient size. In the other industries one observes the same general pattern that the plant size deviation decreased over time. The adjustment process towards more cost efficient plants can be clearly seen in Table 5 and this process was relatively fast if one takes into account that the time period 1979-85 under consideration is relatively short.

Based on the results in Table 5, how can one explain the variance of plant size deviations across industries? Various factors explain the deviation, which can be labeled as industry-specific and trade-specific factors. If one considers the extration of minerals and the motor vehicles industries, in which the average plant size is close to the MES, one finds different factors explaining the small deviation. In the extraction of minerals industry the structure of the market consists of various local markets which are determined by the location of the inputs and the transportation costs. These local markets are protected from trade by natural entry barriers and are large enough to exploit scale economies. In the motor vehicles industry, on the other hand, international competition is the main force for driving plants toward a cost efficient size. In general, plant size deviations from MES exist mainly because markets are too small in relation to MES, trade barriers hinder the extension of markets, demand growth is not high enough to reduce excess plant capacity, and shipment costs as well as product variety lead to a fragmentation of markets which are smaller than MES.

A more systematic insight into the importants of factors explaining the plant size deviation, is provided by the regression analysis which we want to perform now. The regression model is specified in a similar fashion than in Section III as follows:

$$PSD_{it} = b_{0t} + b_{1t}\, MS_{it} + b_{2t}\, E_{it} - b_{3t}\, I_{it} + b_{4t}\, CR_{it} + b_{5t}\, GR_{it} + b_{6t}\, PR_{it} - b_{7t}\, EM_{it} + \mu_{it} \qquad (2)$$

where

PSD_{it} is the ratio of the average plant size and MES, which is represented by the TOP 50 and MIDPOINT indices, respectively.

MS_{it} is the market size, measured as the ratio of domestic consumption and TOP 50 and MIDPOINT, respectively.

E_{it} is the exports intensity which is measured in two ways: E^T_{it} is the exports intensity based on total exports (=intra + extra-Community exports) and measured by 1+exports/ domestic production.
E^I_{it} is the intra-Community exports intensity, measured by 1+intra-Community exports/total exports.

I_{it} is the imports intensity which is also measured in two ways: I^T_{it} is equal to 1-total imports/domestic consumption and I^I_{it} is equal to 1-intra-Community imports/total imports.

CR_{it} is the seller concentration ratio, measured by the five-firm ratio for the UK and the Herfindahl index for the FRG.

GR_{it} is the percentage growth of production.

PR_{it} is the productivity ratio, measured by the ratio of domestic production and the number of employees.

EM_{it} is the extent of multi-plant operation, measured by the average number of plants operated by firms in the industry.

$b_{0t}, ... ,b_{7t}$ are regression coefficients.

μ_{it} is the error term, representing all other factors which determine plant size deviations.

Indices i represent three-digit industries in the UK and four-digit industries in the FRG and

t stands for the time periods 1979, 1985 for the FRG and 1979, 1983 for the UK.

Equation (2) shows that seven explanatory variables were selected for which data are available. Expected signs of the causal relationship between the endogenous variable and the exogenous variables are shown in the regression model. The core variables are the market size, exports, and imports variables. With respect to these variables we expect that market size has a positive influence on plant size development. Markets which are large in relation to MES output might have a favorable effect on plants' capacity expansion decision. Thus, we expect $b_{1t}>0$. Exports and imports (total as well as intra-Community) influence plant size decisions positively. Exports increase the relevant market and open the opportunities to build larger plants. Imports put pressure on domestic firms' decision makers to increase their plant sizes toward the most cost efficient size. Thus, b^T_{2t} and $b^T_{3t}<0$. In addition, the impact of Intra-Community trade on plant size decisions might be even higher. Therefore, we expect more cost efficient plants in industries in which the ratio of intra-Community to total trade is higher. Thus, $b^I_{2t}>0$ and $b^I_{3t}<0$.

From the additional variables we expect explanatory power as well. Among them the concentration variable, since concentrated markets might have larger plants due to the fact that large market shares by dominant sellers provide the chance to build larger plants. Thus, we expect $b_{4t}>0$. If, however, markets are fragmented, we might expect even large sellers to favor a multiple plant structure. The average number of plants operated by firms is therefore a good indicator of the existence of local markets. We therefore might expect a negative association between plant size deviations and the extent of multi-plant operation, i.e. $b_{7t}<0$. Market growth might have a positive effect on plant size decisions. Indivisibilities in physical production capacity lead to a certain extent of excess capacity at a time when new capacity is set up. This risk of holding excess capacity permanently will be reduced if demand growth is be expected, thus $b_{5t}>0$. Finally, the productivity of the labor force might also have positive effects on plant size decisions. The higher the labor productivity will be, the more firms will be inclined to operate larger plants, thus $b_{6t}>0$.

Regression Results

Tables 6 and 7 summarize the regression results for the sample of up to 105 four-digit industries in the FRG and of 103 three-digit industries in the UK.[3] For the FRG, we were able to run regressions for the periods 1979/1985 and for the UK for 1979/1983. Furthermore, the data samples for the FRG and the UK differ slightly in two respects: for the FRG , the data on trade flows allow to make the distinction between intra-Community and total trade flows, whereas for the UK, only total trade flow data were available. In addition, for the UK we only have access to the TOP 50 measure of minimum efficient plant size. And finally, separate regressions were performed for the producer and consumer goods industries in the FRG.

The results in Tables 6 and 7 for the total sample show that nearly all coefficients of the explanatory variables have the expected

[3] The usual statistical tests were performed. The test of the functional form showed a linear specification to be preferable. No heteroskedasticity was detected. Also no severe multicollinearity is present.

signs. The coefficients of all exports variable (total and intra-Community) are highly significant for the German sample, but not for the UK in both time periods. We can conclude that the convergence towards more efficient plant sizes is significantly affected by total exports as well as intra-Community exports in the FRG, and the importance of exports has increased over time. For the UK, we find slight support for the proposition that total exports are a increasing force driving plant size developments, but this support is not statistically significant. If we divide the sample into producer and consumer goods industries, we find that only in producer goods industries are exports an important determinant of plant sizes in the FRG. In consumer goods industries, by contrast, exports do not seem to play any role at all, even over time.

Imports, on the other hand, also have a positive impact on plant sizes but we cannot put to much weight on it since the coefficients are not statistically significant in both countries and both periods. Additionally, we observe an increase in the coefficients over time which suggests that the positive influence of imports on plants size developments became more important over time.

Market size and demand growth are both powerful explanatory variables. In both countries, larger and faster growing markets provide the opportunity to build larger and more cost efficient plants. The size of the market in the UK seems to be the dominant factor affecting plant size decisions. If one takes the significant effect of the concentration variable into account as well, one is inclined to argue that large markets in the UK are well protected by entry barriers, maybe because of cost efficient production. Entry barriers may also explain why intra-industry trade flows are less pronounced between the UK and other countries.

Seller concentration is a powerful explanatory factor in both countries, and also in both subgroups of industries. However, the significance of concentration is more pronounced in the UK. The results suggest that large sellers in concentrated industries in the UK seem to operate with larger plants, whereas in the FRG a higher extent of multi-plant operation is preferred. The regression results on the extent of multi-plant operation support this view: the more important the concentration variable is in explaining plant sizes, the larger the plants are and the smaller the number of plants operated by large firms.

Labor productivity has no explanatory power in either country. The coefficient shows in most regressions the expected sign but the effect is not statistically significant. This result is somewhat surprising since we would expect cost efficient plants to have a higher labor productivity.

If we compare the results on market size, exports, and imports with the one in Section III, we see that the signs of the regression coefficients remain stable. However, the values of the coefficients are different. At the industry level we receive lower values which seems to be the consequence of moving from the product-line level to a more aggregate industry level analysis.

V. Evaluation of the Overall Results and Comparative Static Analysis

The results show positive and increasing effects of exports and imports on plant size developments towards more cost efficient plant sizes in the FRG and the UK. The results can be used to speculate to what extent trade flow changes affect plant sizes and cost efficiency of plants. For this purpose we experiment with the average values of the regression variables and their estimated coefficients in Section III. First of all, we are interested in the plant size effect of trade flow increases. For simplicity, we assume that exports and imports flows increase by 10 percent. If we calculate the growth rate for each period and each country separately we receive the following results:

		Exports	Imports
FRG	1965	4.7%	7.3%
	1982	8,5%	16.5%
UK	1982	19.4%	4.1%

These numbers tell us that a 10 percent increase in exports and imports would increase average plant size in the FRG in 1965 by 4.7% and 7.3%, respectively. And in 1982 the increase would be 8.5% and 16.5%. In the UK, the increase in average plant size would be even 19.4% if exports increase by 10% and 4.1% if imports increase by the same amount. This seems to be a rather strong response to changing trade flows.

In comparison with the above speculative results we are able to calculate the actual overall trade effect for the FRG. Taking the actual average increase of 73 percent in exports and 107 percent in imports during the period 1965 to 1982 into account, we receive an average plant size growth by 97 percent. Therefore, trade flows basically doubled plant sizes within the observed time period.

Our second exercise will be to speculate about the impact of a plant size increase on the improvement on the cost efficiency of plants. If plants increase in size due to increasing trade flows one should expect an increase in cost efficiency as well. To what extent this improvement in cost efficiency can be depends on the increase of trade flows. Three scenarios are worth considering: First, exports increase by 100 percent. Second, import flows double in size and third, both exports and imports increase each by 100 percent. For each scenario we will be able to calculate the expected effect on cost efficiency under the additional assumption that total consumption remains unaffected by trade flow increases.

If exports increase by 100 percent, the export share on total domestic production increase from its level in 1982 of 36.6 percent to 53.6 percent at a later point in time. As a consequence, average plant size increases should have a decreasing effect on unit costs. Prior to the export increase, actual average plant size had 14.94

percent higher unit costs than a MES plant. After doubling of exports, the disadvantage by sub-MES plants diminished to 12.49 percent. As a result, the increase of cost efficiency is about 16.4 percent.

If imports increase by 100 percent, we expect an increase in cost efficiency as well, since imports have also a positive effect on plant size development in the FRG and the UK. Actual import share on total domestic consumption was in 1982 about 32.1 percent and it would be twice as much after the import increase by 100 percent. The corresponding cost efficiency improvement is about 26.5 percent which leaves the average plant size with 10.98 percent higher costs than a MES plant. The cost efficiency increase by imports is therefore higher than the effect of increasing exports flows.

If exports and imports increase in magnitude and total domestic consumption still remains unchanged, domestic production has to decrease. The overall effect will be a rise in cost efficiency of about 55 percent. This efficiency increase is considerable taking into account that average plant size is now larger than one half (0.518) of a MES plant which leaves a cost disadvantage of only 6.72 percent.

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Table 1 : Trends in Community Imports Trade in Manufacturing Industries

Industry	1963	1970	1975	1981	1982	1963	1970	1975	1981	1982
	Intra-Community Imports					Extra-Community Imports				
Manufacturing Industry	8,5	23,3	49,8	105,1	120,5	10,8	22,2	41,5	105,9	120,5
Mineral oil refining	3,9	10,6	38,5	95,0	101,4	4,6	3,8	22,7	109,5	145,1
Production and preliminary processing of metals	11,0	28,7	47,0	89,6	95,9	13,0	38,4	44,8	79,6	87,2
• Iron and steel	14,9	33,2	52,9	91,8	99,7	13,3	38,0	49,7	74,0	109,2
Non-metallic mineral products	8,7	24,0	47,2	99,9	106,8	9,4	22,9	43,2	109,1	112,7
• Concrete, cement, plaster products for construction	12,7	31,2	62,2	92,0	97,9	15,9	28,3	70,3	109,9	114,6
• Glass and glassware	8,8	26,1	46,2	102,1	113,7	7,8	19,0	36,9	105,5	118,8
Chemicals and man-made fibres	6,2	19,7	45,1	111,3	123,2	10,4	25,1	45,1	113,5	126,3
• Basic industrial chemicals	5,7	17,3	42,4	110,0	121,0	10,6	25,2	45,1	112,4	123,6
• Pharmaceutical products	5,4	24,6	50,9	119,9	134,8	8,3	23,2	46,3	120,8	138,8
Metal articles	8,5	25,0	52,1	99,7	107,7	7,3	19,4	44,9	104,3	112,9
• Tools and finished metal goods	9,1	24,2	46,4	100,5	111,8	6,6	17,7	42,0	107,0	111,5
Mechanical engineering	11,4	28,3	53,3	99,0	108,8	11,9	26,4	50,4	112,1	124,8
• Machine-tools for working metal	15,5	35,9	55,3	100,2	101,9	13,7	26,5	40,7	101,1	103,6
• Plant for mines, iron and steel, etc.	10,5	29,8	55,8	94,0	97,7	13,3	28,5	54,1	106,8	116,6
Office and data-processing machinery	5,6	25,6	46,6	121,6	150,2	4,1	21,4	35,3	127,6	157,2
Electrical engineering	8,3	25,2	52,4	105,0	117,7	6,0	17,3	38,9	124,0	143,2
• Electrical machinery	9,0	27,3	49,8	99,9	110,6	8,8	24,1	43,2	115,6	131,1
• Telecommunications equipment, etc.	8,0	24,1	52,7	109,2	125,4	7,0	20,4	43,5	120,9	141,4
• Radio, television, etc.	8,4	25,2	55,2	107,0	118,1	4,8	14,6	36,7	129,1	150,7
• Domestic type electric appliances	9,0	25,0	59,9	107,9	119,8	4,1	12,3	39,9	132,2	134,8
Motor vehicles	6,6	21,7	44,4	108,3	126,1	2,5	7,9	28,3	112,0	124,7
Other means of transport	13,0	23,9	55,3	130,7	168,8	4,5	17,6	34,8	106,0	103,7
• Shipbuilding	13,7	35,3	95,5	91,1	92,3	4,6	32,6	63,4	86,2	100,3
• Aerospace equipment manufacturing and repairing	13,3	20,7	43,6	152,4	215,7	4,7	15,3	27,5	108,9	101,9
Instrument engineering	7,3	20,6	47,8	105,1	113,1	5,9	14,9	39,0	118,6	125,4
Food, drink, and tobacco	9,5	22,6	58,7	115,9	133,2	31,8	38,0	59,4	111,6	124,0
Textile	25,9	57,1	104,5	105,2	230,3	19,7	35,5	77,5	114,3	221,2
Leather and leather goods	13,2	25,5	56,6	103,7	123,0	7,5	15,2	43,1	107,1	123,8
Mass-produced footwear	5,5	17,1	42,1	99,6	117,3	3,9	10,6	31,9	109,9	117,5
Ready-made clothing	6,1	20,6	50,5	103,0	114,6	3,8	10,9	43,3	114,1	125,9
Timber and wooden furniture	6,3	18,5	45,2	102,1	107,2	16,1	26,7	39,3	95,3	95,8
Pulp, paper and paper products	6,1	21,9	47,6	114,7	127,0	17,8	33,8	60,9	118,5	122,5
Printing	9,0	24,1	49,3	106,3	115,7	9,4	25,1	47,3	119,2	130,6
Rubber products	6,8	21,0	51,2	109,1	115,2	8,3	18,8	40,4	104,2	119,6
Plastic products	5,1	18,9	43,1	108,4	121,0	7,7	19,5	41,0	115,7	133,0

Source: Yearbook of Industrial Statistics, 1984, pp. 118-119.

Table 2: Average Firm Size in the European Community's Manufacturing Industries

NACE No.	Industries	Average Number of Employees in Firms Years 1975	1982	Slope of Trend 1975-82
22	Production of preliminary processing of metals	548.2	486.4	-6.486
23	Extraction of minerals	84.8	89.2	0.426
24	Manufacture of non-metallic mineral products	132.7	127.9	-1.540
25	Chemical industry	326.3	327.3	-0.235
31	Manufacture of metal articles	110.6	100.8	-1.460
32	Mechanical engineering	175.1	158.5	-2.576
33	Manufacture of office machinery and data processing machinery	977.5	748.1	-27.156
34	Electrical engineering	405.3	339.2	-10.642
35	Manufacture of motor vehicles	704.7	697.8	2.030
36	Manufacture of other means of transport	477.2	492.7	1.374
37	Instrument engineering	134.9	116.8	-2.581
41	Food industry	163.1	163.1	-0.694
43	Textile industry	150.7	132.3	-3.507
44	Leather industry	72.5	66.8	-0.827
45	Footwear and clothing industry	104.5	99.1	-1.385
46	Timber and wooden furniture industry	75.7	72.4	-0.514
47	Manufacture of paper and paper products; printing and publishing	128.3	117.0	-1.510
48	Processing of rubber and plastics	158.3	145.3	-2.045
49	Other manufacturing industries	93.7	83.9	-1.458

Source: Own calculation from 'CRONOS SEF VISA'

Table 3: Estimates of Economies of Scale

NACE No.	Industry	Minimum Efficient Scale (MES)	Unit Cost Increase 1/3 MES	Unit Cost Increase 1/2 MES	Year	Source
140.1	Mineral oil refining	10 million tons/year	<5%		1982	DIW
		10 million tons/year		5%	1969	Pratten
		5.95 million tons/year		3%	1967	Weiss
		10 million tons/year	4.8%		1965	Scherer
221	Steel (integrated plants)	9.6-12 million tons/y	>10%		1982	DIW
		4.1 million tons/year		8%	1969	Pratten
		3.6 million tons/year		10%	1967	Weiss
		3.6 million tons/year	11%		1965	Scherer
241	Bricks	35 million a year	30%		1982	Schwalbach
		25 million a year		25%	1969	Pratten
242.1	Cement	1.3 million tons/year	39.9%		1982	Schwalbach
		1.0 million tons/year	38.2%		1972	Schwalbach
		2.0 million tons/year		9%	1969	Pratten
		1.2 million tons/year	26%		1965	Scherer
247.2	Glass Bottles	133,000 tons a year	11%		1965	Scherer
		180,000 tons a year	13%		1982	Schwalbach
251	Basic industrial chemicals					
	* Ethylene	500,000 tons/year	5-10%		1982	DIW
	* Sulphuric acid	350,000 tons/year	5-10%		1982	DIW
		1 million tons/year		1%	1969	Pratten
	* Ammonia	550,000 tons/year	5-10%		1982	DIW
	* Synthetic rubber	60,000 tons/year		15%	1969	Pratten
	* Synthetic yarn	40,000 tons/year		7%	1969	Pratten
	* Synthetic polymer	80,000 tons/year		5%	1969	Pratten
255	Paint	38 million litre/year	4.4%		1965	Scherer
258.1	Soap and detergents	70,000 tons/year		2.5%	1969	Pratten

Table 3 , cont.

260	Man-made fibres					
	* Acrylic fibres	19,278 tons/year		9.5%	1967	Weiss
	* Polyester fibres	18,144 tons/year		10%	1967	Weiss
	* Cellulosic fibres	31,752 tons/year		5%	1967	Weiss
321.1	Combine harvester	20,000 units/year	10%		1982	DIW
321.2	Tractors	90,000 units/year		6%	1982	DIW
330	Electronic typewriters	500,000 units/year	5-10%		1982	DIW
343.2	Auto batteries	1 million units/year	4.6%		1965	Scherer
345.1	T.V. sets	1.3-2.2 million units/y	5%		1982	DIW
346	Fridges machines	800,000 units/year	6.5%		1965	Scherer
		500,000 units/year		8%	1969	Pratten
		1.5 million units/year	12%		1982	DIW
	Washing machines	500,000 units/year		8%	1969	Pratten
		800,000 units/year	7.5%		1980	Müller/ Owen
351	Cars	500,000 units/year	15%		1982	DIW
	Trucks	200,000 units/year	12%		1982	DIW
363.1	Bicycles	100,000 units/year		4%	1969	Pratten
427.1	Beer brewing	2.8 million hl/year	18%		1981	Schwalbach
		2.0 million hl/year	14%		1974	Schwalbach
		3.0 million hl/year		7%	1980	Cockerill
		1.6 million hl/year		9%	1969	Pratten
		5.3 million hl/year	5%		1965	Scherer
		2.4 million hl/year		10%	1967	Weiss
429	Cigarettes	70 billion units/year	3%		1982	DIW
		36 billion units/year	2.2%		1965	Scherer

Table 3. cont.

451	Footwear	4,000 pairs a week	1.5%		1980	Müller/ Owen
	Leather shoes	1 million pairs/year	1.5%		1965	Scherer
	Shoes	300,000 pairs/year		2%	1969	Pratten
481.1	Car tyres	9 million units/year	5-10%		1982	DIW
		16,500 units/day		5%	1967	Weiss

Source: DIW (1985), Empirische Untersuchung von industriellen Größenvorteilen (Economies of Scale) nach der Methode der Ingenieurschätzungen, Berlin.

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Table 4: Regression Results on Plant Size Deviation and International Trade

Dependent variable: Ratio of average plant size and minimum efficient plant size

Country	Year	Number of cases	Constant	Market size	Cost gradient	Exports	Imports	R^2
			Regression Coefficients					
FRG	1965	22	0.181*** (5.05)	0.0004 (0.94)				0.042
			0.194*** (3.32)	0.0004 (0.86)	0.125 (0.29)			0.047
			-0.382* (-1.39)	0.0007* (1.58)	0.182 (0.44)	0.443** (2.14)		0.240
			-0.225 (-0.52)	0.0007* (1.56)	0.219 (0.51)	0.425** (1.98)	-0.166 (-0.48)	0.250
	1982	20	0.217*** (4.66)	0.002** (1.83)				0.156
			0.262*** (3.37)	0.0014* (1.65)	0.372 (0.73)			0.182
			-0.574** (-1.81)	0.002*** (2.67)	0.115 (0.25)	0.562*** (2.70)		0.438
			-0.079 (-0.14)	0.0016** (1.73)	0.257 (0.53)	0.353 (1.24)	-0.319 (-1.07)	0.478
			0.653*** (4.94)				-0.599*** (-3.21)	0.365
UK	1982	19	-0.105*** (-3.36)	-0.133 (-0.43)				0.011
			-0.510*** (-3.29)	-0.198 (-0.61)	-0.887 (-0.79)			0.048
			-0.221*** (-3.39)	-0.145 (-0.45)	-0.422 (-1.10)	0.714** (2.34)		0.303
			-0.201*** (-3.06)	-0.143 (-0.43)	-0.417 (-1.07)	0.724** (2.05)	-0.056 (-0.06)	0.303

Significance levels: *** 1%, ** 5%, * 10%, two-tailed test.

Table 5: Plant Size Deviation in Manufacturing Industries in the Federal Republic of Germany, 1979-1985.

NACE No.	Industries	Ratio of Average Plant Size and Minimum Efficient Plant Size (MES)	
		1979	1985
14	Mineral oil refining	0.40	0.60
22	Production and preliminary processing of metals	0.44	0.62
23	Extraction of minerals	0.60	1.20
24	Manufacture of non-metallic mineral product	0.53	0.82
25	Chemical industry	0.28	0.37
31	Manufacture of metal articles	0.45	0.54
32	Mechanical engineering	0.35	0.42
34	Electrical engineering	0.33	0.50
35	Manufacture of motor vehicles	0.53	1.08
37	Instrument engineering	0.44	0.58
41/42	Food, drink, and tobacco	0.50	0.68
43	Textile industry	0.54	0.64
45	Footwear and clothing	0.63	0.78
46	Timber and wooden furniture	0.62	0.75
47	Manufacture of paper and paper products; printing and publishing	0.50	0.59
48	Processing of rubber and plastics	0.46	0.56

Table 6: Empirical Results on the Determinants of Plant Sizes in the Federal Republic of Germany

Dependent variables: D_1 = Average plant size/MIDPOINT plant size
D_2 = Average plant size/TOP50 plant size

Independent variables	1979				
	Industries				
		All		Producer	Consumer
	D_1	D_1	D_2	D_1	D_1
Exports, total	0.015*** (3.07)		0.016*** (5.28)	0.016*** (2.76)	0.0014 (0.17)
intra		0.320*** (3.15)			
Imports, intra		-0.060 (-0.77)			
Seller concentration	-0.0006*** (-1.98)	-0.0007** (-2.05)	-0.0001 (-0.61)	-0.001* (-1.41)	-0.001** (-2.84)
Market size	0.00009** (1.73)	0.00008* (1.32)	0.00005 (0.70)	0.0002*** (2.42)	0.00002 (0.29)
Demand growth	0.105 (1.26)	0.071 (0.78)	0.095** (1.98)	-0.028 (-0.23)	0.113 (1.12)
Labor productivity	0.00001 (0.22)	-0.00001 (-0.28)	-0.00001 (-0.17)	0.00005 (0.08)	-0.00004 (-0.05)
Multi-plant operation	0.007 (0.48)	0.012 (0.72)	0.004 (0.50)	0.002 (0.09)	0.037* (1.65)
Constant	0.332*** (3.73)	0.283** (2.51)	0.092** (1.80)	0.406** (3.34)	0.372*** (3.11)
R^2	0.215	0.184	0.282	0.381	0.212
No. of cases	102	102	102	49	53

Significance levels: *** 1%, ** 5%, and * 10%, two-tailed test.

Table 6: cont.

Independent variables	1985				
	Industries				
		All		Producer goods	Consumer goods
	D_1	D_1	D_2	D_1	D_1
Exports, total	0.039*** (4.83)		0.020*** (4.12)	0.043*** (3.41)	-0.0019 (-0.16)
intra		0.655*** (3.91)			
Imports, intra		-0.055 (-0.82)			
Seller concentration	-0.00001 (-0.19)	0.000007 (0.18)	0.00001 (0.28)	-0.00002 (-0.41)	0.00004 (0.97)
Market size	0.0002*** (3.91)	0.0003*** (4.47)	0.0001* (1.61)	0.0004*** (4.84)	0.0001 (1.28)
Demand Growth	0.267*** (2.86)	0.374*** (3.68)	0.144*** (2.60)	0.112 (0.66)	0.161** (1.77)
Labor productivity	0.000003 (0.08)	-0.00004 (-0.80)	0.00002 (0.95)	-0.00004 (-0.68)	-0.00001 (-0.17)
Multi-plant operation	-0.101** (-2.28)	-0.083* (-1.64)	-0.198*** (-2.58)	-0.436** (-1.71)	-0.078** (-2.09)
Constant	0.240*** (3.17)	0.006 (0.042)	0.094** (2.09)	0.244** (2.00)	0.480*** (5.39)
R^2	0.438	0.390	0.539	0.691	0.177
No. of cases	105	105	105	52	53

Table 7: Determinants of Plant Size Deviation in the United Kingdom

Dependent variable: Average plant size/TOP50 plant size

Independent variables	1979	1983
Exports, total	0.006 (0.23)	0.020 (0.76)
Imports, total	-0.002 (-0.65)	-0.001 (-0.23)
Seller concentration	0.124** (2.33)	0.151** (2.32)
Market size	0.0006*** (7.92)	0.0005*** (8.00)
Demand growth	0.181** (2.63)	0.080* (4.52)
Labor productivity	0.0002 (0.08)	-0.002 (-0.73)
Multi-plant operation	0.005 (0.35)	0.149* (1.33)
Constant	0.194*** (2.62)	-0.038 (-0.28)
R^2	0.466	0.424
No. of cases	103	103

CHAPTER 4

Economies of Scale and the integration of the European Economy: the Case of Italy

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Contents

Tables

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.

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.

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 (-1.61)	-0.002 (-0.78)	0.006 (1.12)	0.572 (1.89)	0.080 (0.43)	0.34	0.05	1.18

* 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.

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:

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

(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:

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

(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 8). 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 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).

4.40

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.

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)

4.44

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).

4.57

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 (bn.lira)	%	1984 (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 clearcut 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

	20-99 %	100-499 %	more than 500 %	TOT N.	M
	Distribution of Employment by Firm Size				
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 instal-lations
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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CHAPTER 5

The Costs of Non-Europe

An Assessment based on a formal Model of Imperfect Competition and Economies of Scale

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Contents

Tables

Introduction

The aim of the work reported here is to assess the likely economic effects of reducing barriers to trade within the European Community in a range of industries in which there may be significant economies of scale. The projections are based on a formal partial equilibrium model of international trade in imperfectly competitive markets. A model of this nature may capture two effects of completing the internal EC market: increased exploitation of economies of scale, and the potential effects of market liberalisation on competition.

The next section presents a simple example of a model of international trade under imperfect competition, in an attempt to give a reasonably simple account of the essential nature of the more complex model used to produce the projections in this report. A full description of the actual model used (which is a development of the model described in Venables and Smith (1986)) is provided in a technical appendix.

Section 2 then describes the data to which the model is applied; and section 3 the "calibration" of the model to the data.

In section 4 the results of one policy experiment are described: a reduction in intra-EC trade barriers equivalent to a reduction in the cost of intra-EC trade of 2.5%. The effects on trade, output, production costs and economic welfare are determined. Section 5 considers the sensitivity of the results to changing our assumptions about firms' behaviour.

Section 6 describes the results of a more dramatic change in the intra-EC market structure, where in addition to the reduction in trade barriers, it is assumed that firms are no longer able to charge different prices in different national markets within the EC. This shift to an "integrated" market produces substantially larger economic effects than the earlier policy experiment.

1. Modelling trade under imperfect competition

The full model on which this exercise was based is set out in the technical appendix. It may, however, be helpful to see some of the essential economic features of that model displayed in a simpler example. Accordingly, as an introduction to the modelling exercise, in this section we present an artificially simple example of trade under imperfect competition. We also discuss some further aspects of the modelling of imperfect competition.

Suppose that there are two countries with identical demands for a particular homogeneous good. Let the demand y in either country be given by the following function of the consumer price p (in \$)

$$y = 10000p^{-2}$$

which implies that the elasticity of demand is 2. The inverse demand function is

$$p = 100y^{-1/2}$$

Let the cost of producing quantity x of the good be

$$C = 7x + 111$$

which implies that the average cost is a decreasing function of output, so there are economies of scale. Suppose that a firm receives the consumer price p_1 in respect of sales in respect of sales in its home market, but receives $p_2(1-t)$ from a unit sold in its foreign market, where the fraction t represents the cost of selling across the border. Then the profits of a firm which sells x_1 at home and x_2 abroad will be

$$\pi = p_1x_1 + p_2(1-t)x_2 - 7(x_1+x_2) - 111$$

If the firm chooses x_1 and x_2 in the belief that the sales to both markets of all other firms are fixed, then differentiation of its profit function gives rise to two equations describing its optimal sales decisions in the respective markets

$$p_1(1-s_1/2) = 7$$
$$(1-t)p_2(1-s_2/2) = 7$$

where the left hand side of each equation is the marginal revenue in the respective market, the right hand side is marginal cost, and s_i is the firm's share of the respective market. Note how marginal revenue depends both on the elasticity of demand and on the market share.

If t=0.2 and there are two firms in each country, then the outcome of profit maximising behaviour by the four firms will be a price of \$9 in both countries, production of 5000/81 units of output by each firm, of which 8/9 is sold in its home market and 1/9 exported. Each firms then has 4/9 of its home market and 1/18 of its export market. It is easily checked that the firms' profit-maximising equations are satisfied and that supply equals demand in both markets at this price. It is also the case that firms' profits are virtually zero, so this is a long-run equilibrium.

If now t were reduced to zero, it is easily checked that if the four firms remain in existence, the price charged will fall to \$8, and production of each firm will rise to 5000/64, of which half is sold in each market (so firms' shares of their home market falls from 4/9 to 1/4 and of their export markets rises from 1/18 to 1/4). There is a gain of consumer surplus of almost \$139 in each of the two countries as a result of the price reduction, and each of the four firms suffers losses of almost \$33; so in aggregate the reduction in trade costs brings about a rise in welfare. The price reduction is very much greater than the reduction in trade costs because the main effect of the change is that increased competition from imports considerably reduces the market power that firms have in their home markets and drives down prices.

The fact that firms are making losses implies that they will wish to exit from the industry. It is easily checked that if one firms exits (and since there are now no trade costs, the nationality of the exiting firm is irrelevant) then the remaining three firms increase their output to approximately 5000/53, enjoy lower costs, and make positive profits of just over $21 each. The price to consumers is higher at $8.40 than with four firms, and the consumer surplus gain is therefore lowered to a little over $79, and the aggregate welfare gain at approximately $222 in total exceeds the welfare gain of $146 in the previous case.

This example, simple though it is, illustrates some of the main features of the empirical model which follows. However, there is more involved in what we do below than a straightforward generalisation of the above example to encompass six countries, larger numbers of firms, and real world data.

The principal feature of the model we have used which is not illustrated in the above example is product differentiation: consumers having preferences between different varieties of the same product. This introduces two features into the model (both of which are discussed further in section 3 below): firms have to choose the number of varieties to produce; and their ability to set prices for individual varieties means that their marginal revenue now depends not just on market share and on the elasticity of demand for the product as a whole (as in the above example), but also on the elasticity of demand for the individual variety.

Casual empiricism suggests that product differentiation is an important feature of the markets for many manufactured products, and (as is explained in section 3 below) the data we use in our modelling give strong support to this view. The introduction of product differentiation thus enriches as well as complicates the model.

There are two further distinctions which play a role in the paper but are not explicitly illustrated in the example above.

The first is the distinction between "Cournot" and "Bertrand" competition. In the example we assumed that each firms supposed that other firms' sales were given when it decided how much to sell; and this is the Cournot hypothesis. An alternative, the Bertrand hypothesis, would be to assume that firms set their prices on the assumption that other firms prices are given. It is not very illuminating to look at the Bertrand hypothesis in the above example because, in the absence of product differentiation, Bertrand pricing degenerates to pricing at marginal cost. However, in models with product differentiation, Bertrand behaviour is compatible with imperfect competition, though it still leads to substantially more competitive pricing than does Cournot behaviour. We suggest below that the Cournot hypothesis may be the more attractive in the weight that it places on market shares as a determinant of firms' behaviour.

The second distinction plays a more crucial role in our results. In the example above, the removal of trade barriers had a very dramatic effect on the competitive structure of the model. We shifted from an equilibrium in which each market was dominated by two domestic firms with a small fringe of importers to an equilibrium in which all four firms (or after exit, all three firms) had equal market shares. Effectively the two markets, which previously were segmented, now behave as if they were a single integrated market. In the presence of product differentiation, removal of trade costs might not be sufficient to produce this outcome (consumers might, for example, have genuine preferences for home-produced varieties which give firms larger shares of home markets than of foreign markets). Further, without product differentiation, it is not possible to make the market integrated other than by setting trade costs to zero. In the model with product differentiation, however, it is possible without setting trade costs to zero to consider the effect of imposing on firms the requirement that they do not price discriminate between markets and charge the same factory-gate price to all consumers (though consumers in foreign markets still have to pay the trade cost on top of the uniform factory-gate price). This sort of policy has the same sort of strongly pro-competitive effect, even with positive trade costs, as did the removal of all trade costs in the example above, and for essentially the same reason: once firms look on the market as being a single integrated market, the market power that was conferred on them by asymmetrically large home market shares is diminished. The single most striking result that we describe below is that a policy which succeeded in making firms act on an EC-wide integrated market basis is likely to have much larger welfare effects than a policy which simply reduces border barriers.

2. Model coverage and data sources

The model treats the world market for a product as being divided into six "countries": France, the Federal Republic of Germany, Italy, the UK, the rest of the EC, and the rest of the world. The model has been applied to the following selection of three digit NACE industries:

242 cement, lime and plaster
257 pharmaceutical products
260 artificial and synthetic fibres
322 machine tools ..
330 office machinery
342 electric motors, generators, transformers, ..
346 electrical household appliances

351 motor vehicles and engines
438 carpets, carpeting, oilcloth, linoleum, ..
451 footwear ..

These sectors were chosen as a relatively heterogeneous group of industries, for all of which some estimates of economies of scale are available, and some of which might be relatively strongly affected by the completion of the European market, e.g. because of the role of public procurement or technical standards.

Data on bilateral international trade flows between these "countries" in each of the ten sectors listed above was obtained from the Eurostat NACE-CLIO trade tables for 1982. Domestic production statistics for the EC countries were obtained from the Eurostat Annual Industrial Survey. Unfortunately, production data for the rest of the EC seem quite unreliable and for the rest of the world are unavailable. For each industry, therefore, values were chosen for production in these "countries" that gave them approximately the same ratio of production to total exports (for the rest of the EC) or to exports to the EC (for the rest of the world) as the average for the four individually identified EC countries. These numbers were required to complete the model; and the fact that they were estimated in a fairly arbitrary way means that great caution should be exercised in interpreting results relating to the rest of the EC or the rest of the world.

(Data for exports by the rest of the world to the EC were not available in the NACE-CLIO export tables and values were derived from the import tables, adjustments being made for observed systematic discrepancies between export and import data.)

Even though the trade data are classified by nace-clio, and even after the above adjustments, there remained evident problems in reconciling the trade and production data, presumably largely arising from the fact that the trade data refer to commodities classified to the relevant nace-clio groups while the production data refer to firms (though the treatment of re-exports is another potential source of discrepancies). Apparent domestic consumption of domestically produced goods was calculated by subtracting the value of exports from the value of production, but in three cases (office equipment (330) in the UK, and carpets (438) and footwear (451) in Italy) this gave a negative number. An arbitrary adjustment was made to the domestic production figure to bring domestic consumption into approximately the same relation to trade flows as for the other countries.

The first table in each section of Table 1 gives the six-by-six matrix of trade and consumption flows derived for each of the ten industries from the 1982 data. Each row of the matrix refers to the production of a country; and each column to the consumption of a country.

The model requires an estimate of the number of firms in each sector in each country. The Eurostat Structure and Activity of Production data on the size distribution of firms was used to calculate a Herfindahl index of concentration on the basis of which may be calculated the number of "representative" firms in each country. This is the number of equal-sized firms which would give rise to the same effective degree of market concentration as the observed distribution of unequal-sized firms. These numbers are reported for each industry in Table 1. Again, numbers for the rest of the EC and the rest of the world have had to be assumed, to make firm size equal to the average in the four individual EC countries.

It is evident that many of the ten nace-clio classes are too aggregated to be sensibly regarded as covering a single industry and in most cases we have modelled the industry as being divided into a number of equal-sized subindustries. For example, in electrical household appliances there are assumed to be five subindustries. Effectively this amounts to describing each subindustry by a commodity flow matrix and a set of firm numbers that are one fifth of the numbers reported in Table 1.

The model requires information on economies of scale, and we have used the information provided by Pratten (1987), summarising much of that information into two numbers for each industry: the effect on average cost of changing the output of each of the individual product varieties of a firm of minimum efficient scale while keeping the number of varieties constant; and the effect on average cost of changing the number of product varieties, keeping output per variety constant. The minimum efficient scale is taken to be the size of the average "representative" firm in the EC; and where Pratten provides independent information on this, it seems to suggest that this is not an unreasonable assumption. There is an additional aspect of scale economies to consider: the form of the cost function. The simplest form of cost function giving rise to economies of scale is the "linear" function in which there are fixed costs and constant marginal cost. However, in many industries it seems possible that economies of scale would take a form in which marginal cost as well as average cost falls with output, and the simplest form of function with this property is the "loglinear" function, which is a linear function of the logarithms of the variables. In our model we have used a cost function which is a weighted average of these two forms and the weights (based partly on Pratten's information, and partly on casual empiricism) are reported together with the other two scale economy numbers in Table 1.

Finally, we require an estimate of the elasticity of demand for the product of each industry. Here our sources are Piggott and Whalley (1985), Deaton (1975), Houthakker (1965) and Houthakker and Taylor (1970), and the numbers we use are reported in Table 1.

1982 was chosen as the base year for the projections because of the fact that industrial survey data for later years is incomplete. Even though from a macroeconomic viewpoint, 1982 was an atypical year for the European economy, we do not think that this fact will have any significant impact on the general nature of the results we obtain.

3. Calibration

The process of model "calibration" consists of finding a set of numerical parameters for the model which are consistent with the information presented in the previous section.

The first requirement is that firms' output decisions satisfy the condition that marginal revenue in each of the six markets equal the marginal cost of producing the good. The simplified model of section 1 shows how marginal revenue depends on market share and on the elasticity of demand for the product. The pattern of production and trade reported in Table 1 cannot, however, be described by such a simple model, for it would seem that firms are not exploiting their scale economies to the extent that they should. The model used (and described in more detail in the technical appendix) introduces an element not present in the model of section 1: consumers are supposed to distinguish between the different varieties of the same product. Now firms choose their sales levels taking account not only of the effect of their decision on total supply of the product and therefore on the price level of the product in general, but also of the effect that a change in sales has on the price that the firm can charge for its own specific variety of the product. Thus for each industry we calculate an elasticity which would make the data consistent with the hypothesis that the firms were maximising profits in a market with differentiated products.

Our central case is based on a "Cournot" version of the model and the relevant elasticities are reported in Table 1 immediately below "Cournot calibration". The larger the elasticity the less is the degree of product differentiation, and infinite elasticity corresponds to the case of no differentiation where consumers are indifferent between different varieties. Note the contrast between, say, pharmaceutical products (257) and artificial and synthetic fibres (260): the former has a much lower elasticity indicating a higher degree of product differentiation: the difference simply reflects the fact that pharmaceutical products has many more firms in spite of having stronger economies of scale. In most cases, the elasticities take intuitively appealing values, though office machinery (330) has an implausibly low degree of apparent product differentiation. (This may be related to the fact that in this industry the data for the UK are not very satisfactory and the skewed distribution of firm size in Italy may be affecting the estimate of "representative" firm size.)

Not only will different firms' products be differentiated, but one firm can produce different product varieties. There is then the issue of the extent to which we treat large firms as selling large numbers of product varieties or as having long production runs of individual varieties. In calibrating the data, having no information on this issue, we let all the variation in firm size be accounted for by the number of models produced by firms rather than by length of model run, so as to minimise the extent to which differences between firms are introduced into the model without being based on good evidence. In our central policy experiments, we suppose that firms do not change the number of models that they produce, but there are some experiments in which we do let firms vary their model numbers. In this event we need to have firms' model numbers explained by profit-maximising choice: where firms compare the cost of introducing a new model with the extra revenue that will be obtained in _all_ of the markets in which it is sold. When one firm makes this decision it is assumed to anticipate that other firms will react to a change in its number of models, and the "model conjectures" reported in Table 1 are the values of these assumed reactions which are consistent with the data; so, for example, in the case of artificial and synthetic fibres, in the Cournot calibration each firm assumes that a 1% change in the number of its models would bring about a 0.02% change in the number of models produced by all other firms.

Finally, we have to find model parameters which are consistent with the large observed differences in firms' share of different national markets, the share of home firms typically being very much greater than that of foreign firms. These differences may be the result of non-tariff trade barriers such as differences in national regulations, of transport costs, of differences in distribution networks, or of consumer preference patterns. We suppose that transport costs are at an _ad valorem_ level of 10% and attribute the rest of the difference to differences in demand functions whose effect is described in the "tariff equivalent" tables within Table 1. These tables describe the tariff-equivalent values that non-tariff barriers would have to have if the underlying consumer demands for goods were uniform across different national producers and _all_ of the national bias in the observed trade pattern was attributed to trade barriers. (See the technical appendix for further details of the method of calculation.)

A "Bertrand" version of the model was calibrated also, and the elasticities and model conjectures are reported in Table 1, though not the tariff-equivalents (which are different from those of the Cournot calibration, but not remarkably so). Invariably, the model elasticity is lower in this case than in the Cournot case, simply because the Cournot version of the model gives more weight to market shares in the determination of marginal revenue. Bertrand behaviour by firms is inherently more competitive and the observed failure of firms fully to exploit their economies of scale has to be explained by a higher degree of product differentiation (lower model elasticity) and by more pessimistic model conjectures. In the cases of cement (242) and artificial fibres (260), the Bertrand calibration produces an implausibly high degree of product differentiation. We choose the Cournot case for our central projections because, even if it is based on too simplistic a model to capture all of the complexity of real world competitive interaction, it does give an intuitively appealing weight to market shares in describing firms' behaviour.

4. Simulation of reduced trade barriers

Our first set of policy experiments is based on a very conservative interpretation of what is involved in "completing the internal market": the intra-EC implicit trade barriers are reduced equiproportionately so as to reduce trade costs by 2.5% of the value of intra-EC trade. Thus in the case of artificial fibres, all the tariff equivalents were reduced by 13.5%, while in electrical household appliances, where the tariff equivalents were calibrated to be much higher, a 6.6% reduction in their value reduced trade costs by 2.5%. (In the case of footwear, where the calibration suggested the implicit barriers are already quite low, a 2.5% reduction produced implausible effects, and we have modelled the reduction as being 1%.)

The figure of 2.5% could be defended on the basis of Winters's estimate (Pelkmans, Wallace and Winters, 1988) that removal of border measures affecting intra-EC trade should generate direct cost savings of between 1% and 3% of trade. However, Winters also notes the existence of other distorting influences on trade, such as public procurement policies, subsidies and national standards, so our figure of 2.5% could be interpreted as taking a pessimistic view of the possibilities of substantial progress in reducing such distortions. It should, though, be noted that our results can be scaled proportionately to provide approximate estimates of the effects of changes in trade barriers different from the 2.5% reduction.

The effects projected by our model of this policy change are summarised for each of the ten industries in Table 2. Cournot behaviour is assumed and it is also assumed that firms do not change the size of their model ranges. Two sets of projections are reported: one for the case in which the number of firms is unchanged by the policy; and the second for the case in which entry and exit of firms is assumed to take place so as to restore profits to the levels in the base case before the policy change.

Consistently across industries, as one would expect, the first effect is to increase the volume of intra-EC trade, whether or not the number of firms is constant. With a given number of firms, the increased import penetration makes markets more competitive and reduces prices, expands sales, raises consumer surplus and (except where there is a large increase in output) reduces profits. The effect on national output is to reinforce existing differences in trade patterns, so, for example, in pharmaceuticals (257) the UK expands and Italy contracts, while in electrical household appliances (346) Italy expands and the UK contracts. The consistent effect of the output changes is to reduce the EC average value of the average cost of production in each industry.

When the number of firms is allowed to vary in response to profit changes, the usual outcome (with the exception of office machinery (330) in which there are substantial apparent differences in the degree of concentration in different countries) is for there to be a reduction in the total number of EC firms, so that average cost falls further as remaining firms increase in size. Thus in most industries (260, 330, 346, 350, for example), the average EC price falls by more when the number of firms is variable. The effect on consumer surplus is not necessarily as one would expect from looking at prices alone, because consumer surplus is affected also by the variety of products available, and that changes with the number of firms.

Exit of firms tends to raise concentration, but in the version of the model used to generate the projections presented here, the price-cost markup is calculated with the number of firms unchanged. The rationale for this procedure is that, although the model treats all firms in a country as identical, in reality firms differ in size and efficiency, and exit of the least efficient firms should have little effect on the remaining firms' perception of the intensity of the competition they face. (When the model is run with the alternative assumption that exit is fully reflected in the surviving firms' markups the results differ in some details in some industries, but the overall pattern of results is not greatly changed.)

Both with firm numbers fixed and variable, there are effects on extra-EC trade in all industries: extra-EC imports are replaced as the direct costs of intra-EC trade are reduced (trade diversion), while the reduction of EC costs and increase in competitivity reduces EC prices, expands extra-EC exports (a form of trade creation) and further reduces extra-EC imports. The key effect on the EC as a whole of the policy change across the ten sectors are summarised in Table 3 which reports for both variants of the model the percentage change in output, the percentage change in average cost, the change in aggregate welfare (consumer surplus plus profit) as a fraction of the value of total consumption in the base case, and the ratio of welfare gain to intra-EC trade creation. For each industry, Table 3 also reports some key characteristics of the industry. ε, the calibrated value of the individual model elasticity, is high where different varieties of the product are close substitutes (as in 242 and 451) and low where there is strong product differentiation (as in 257 and 342). RS gives the increase in average cost when production runs are reduced to half their minimum efficient scale, so that high values indicate the existence of strong economies of scale, as in 257 and 350. TS gives the share on intra-EC trade in EC consumption and is low in those industries (242 and 342) which seem to have high transport costs. H is the EC average Herfindahl index, and is high in concentrated industries such as 330 and low in industries with many firms such as 342 and 451. DC is the direct cost saving associated with the policy change, expressed as a percentage of base consumption.

Table 3 shows the changes in average cost and the changes in welfare as a proportion of base consumption that result from the policy change. These changes are largest in industries 260, 330, and 350, which all have significant returns to scale and a high proportion of output traded within the EC. Only in those industries, with free entry/exit, do welfare gains exceed 1% of base consumption. It should also be noted that the cost reduction and welfare gain are largest when there is entry and exit, but the effect of entry and exit is significant only in the more concentrated industries and is negligible or negative in 322, 342 and 451. Comparison of the welfare gain with DC shows to what extent the welfare gains are "indirect", in the sense of resulting from adjustment in the market to the policy change, and to what extent they are simply the direct consequence of the reduction in trade costs.

The results of Table 3 show finally that the ratio of welfare gain to trade creation is strongly associated with the degree of returns to scale, exceeding 18% in the free entry case in the four industries, 242, 257, 342 and 350, with the greatest economies of scale, and dropping below 2% in footwear, where scale economies are least. (The fact that trade liberalisation generates welfare losses in the cement industry with a fixed number of firms is a reflection of the very high transport costs in this sector, so that the gains to consumers of increased competition are more than wiped out by the losses to firms.)

The ratio of welfare gain to trade created is a useful statistic to summarise the results of the models because it is not directly dependent on the precise nature of the policy experiment being modelled and can be used to compare our results with those of other studies. Owen (1983, pp.144-147) reports welfare gains of the order of 50% of the value of trade creation, in a study of the effects of the EC that takes account of economies of scale, in contrast with the numbers in our Table 3 which are mostly in the range of 8% to 25%. There seem to be three principal sources of the difference between our results and those of Owen: he assumes a much greater degree of economies of scale; he supposes that industries expand through expansion of existing firms but contract through exit; and he confines attention to uni-directional trade creation, ignoring intra-industry trade. Our results are closer to those generated by the modelling exercise of Harris and Cox (1984, p.114) who estimate in a model with scale economies a welfare gain of 17.5% of trade created by multilateral liberalisation of Canadian trade with the rest of the world.

5. Sensitivity

The preceding section assumed Cournot behaviour and a fixed number of models per firm. While we regard this as our central case, in this section we report the effects of replacing Cournot behaviour by Bertrand, and of removing the assumption that the number of models is fixed.

The difference between Cournot and Bertrand behaviour is that the latter is more competitive in the sense that each firm's actions have less impact on the industry price indices. As noted in section 3 this implies that the calibrated elasticities are lower in the Bertrand case than in the Cournot case, these being reported in table 4 as ε_B and ε_C. Notice that for industries in which the Herfindahl index is very small (for example 322) the two elasticities are similar. Where the Herfindahl index is large the elasticities may be very different. Thus in the cement industry (242) the Cournot elasticity is 35.5, and the Bertrand 8. It seems likely that Bertrand behaviour overestimates the level of competition in this industry, and consequently attaches more weight to product differentiation than is plausible.

What difference does Bertrand behaviour make for the effects of the reduction in trade barriers? The policy works by increasing import penetration, and hence reducing firms' shares in their domestic markets, and so increasing competitiveness. With Bertrand behaviour these changes in market share have less effect on price (as price-cost margins are largely accounted for by product differentiation); the policy therefore leads to smaller price reductions. The smaller magnitude of price reductions means that demand and output increase by less than in the Cournot case, this being accentuated by lower price elasticities. Smaller output changes lead to smaller reductions in average costs (table 4). However, despite the smaller savings in production cost, we see that, when the number of firms is fixed, the welfare gains from the policy are greater in the Bertrand case then in the Cournot case. This is because the increase in trade (which incurs transport costs) is less in this case.

A second consequence of the smaller price reduction in the Bertrand case is that the policy reduces profits by less. When the number of firms is variable there is therefore less exit from the industry (and may be entry as total industry output rises), so leading to smaller reductions in average cost. The welfare gains are now also smaller, on average, although this difference is ambiguous due to lower trade costs and increased product variety, with more firms remaining in the Bertrand case.

The second dimension of sensitivity analysis explored in table 4 is to let the number of product varieties produced by each firm change. This experiment is meaningful only if there is a significant degree of differentiation in consumer demand between products varieties, or there are significant economies of scope. Table 4 therefore does not report results for the "models variable" case for the four industries (242, 260, 438, and 451) where a high value of ε indicates little product differentiation, and our information on economies of scale implies that there is little cost reduction obtained by expanding the number of models produced at given output per model. For the six industries in which this is a meaningful experiment, table 4 shows that the results of the policy are affected in three ways. First, changes in output are now generally (but not invariably) larger, due to the fact that firms have an additional instrument with which to respond to the policy change. Second, the fall in average costs is now generally (but not invariably) smaller. Firms shorten their production runs as they expand their model range. There are economies of scope, but these are smaller than returns to scale in production of a particular model. Third, the welfare gains from the policy are now generally (but not invariably) larger, as the smaller average cost reductions are compensated for by the benefits of increased product variety. The welfare difference is particularly marked in two industries, electrical household appliances (346) and motor vehicles (350); these both being industries in which economies of scope are assumed to be relatively significant.

Overall, we regard the variation in results across different variants of the model as surprisingly small. From the theoretical literature we know that it is possible to construct examples where assumptions on market structure reverse the effects of policy. A sign change of this type is observed in the cement industry (242), but this is readily explicable in terms of the high transport costs in this industry. Apart from this, not only the sign, but also the order of magnitude of the welfare gains, and the ranking of industries by welfare gain are fairly stable across industries.

We have not undertaken formal sensitivity analysis with respect to parameters of the model such as the returns to scale parameters or the overall product demand elasticity. In the former case, the comparison of results for different industries gives a fairly clear indication of how changes in assumptions about scale economies would affect the conclusions (see the discussion of Table 3 in the previous section). In the latter case, it is evident from the formal structure of the model that variations in this elasticity within plausible ranges are most unlikely to have significant or systematic effects on the results of the model, being swamped by the effects of differences in the model elasticity.

6. Simulation of market integration

Table 5 reports the results for the ten industries of a much more dramatic interpretation of what is involved in "completing the internal market". It is assumed that trade costs are reduced as in the previous case, but also that firms treat the whole EC as a single integrated market and have no ability to price discriminate between different "national" markets.

The key to understanding the effect of this change in the market is to recall the role that market share plays in giving firms market power, especially in the Cournot version of the model. When different countries are treated by firms as being different markets, then the large share that firms typically have in their own domestic markets gives them the ability to charge higher prices to home consumers. With EC market integration, shares in "national" markets are no longer of economic significance, and all firms have quite small shares of the whole EC market, even in the more concentrated industries. Thus the change being modelled here is much more strongly pro-competitive than the earlier policy experiment.

The results of the change are reported industry-by-industry in Table 5 and are summarised and compared with the previous, "segmented market", case in Table 6.

In several industries, the shift to integrated markets leads to a reduction in intra-EC trade, reported in the fourth row of each part in Table 6. This is the natural consequence of the reduction in firms' market power in their home markets leading to a reduction in their prices in those markets. More important, in most industries there are much more substantial loss of profits and in all industries much greater gains of consumer surplus in this experiment than in the experiment reported in Table 2. When in Table 6 we compare the two sets of Cournot experiments we find that in the more concentrated industries where firms had significant market power (242, 257, 260, 330, 346, 350) the increase in the competitivity of the market as a result of integration leads to welfare gains quite significantly larger than those in the segmented market case: the impact on economic welfare in these industries of the reduction in trade costs <u>combined</u> with the shift to integrated markets is typically (with fixed numbers of firms) <u>four times</u> the size of the welfare gain from the reduction in trade costs alone and in most of these industries the welfare gain is in the region of 1%-4% of base consumption.

The consequence of the profit change is that if entry and exit are permitted there is greater exit in most industries in the integrated market experiment, and again this implies that the welfare gains are much larger than in the free entry case when markets are segmented. The welfare gains are not invariably larger with free entry than they were with fixed numbers of firms, and most of the gains for concentrated industries are still in the range of 1% to 4% of base consumption but the gain rises to 12% in the motor industry when exit is permitted.

In the segmented market policy experiment, we reported welfare change as a fraction of intra-EC trade creation, but this is not now a meaningful statistic since a reduction in intra-EC trade can be the result of the policy change.

Table 6 also shows that market integration has little effect in those industries where concentration is low (machine tools and footwear) and has little effect in the Bertrand version of the model. This simply reflects the fact that market shares give little market power in these cases, so that a change in market structure which changes effective market shares has little real effect.

Conclusions

It is appropriate to precede our conclusions with a note about the limitations of the kind of exercise that we have undertaken here. We believe that the facts of industrial concentration, economies of scale, and intra-industry trade provide a strong case for modelling many markets as being imperfectly competitive; and only a modelling exercise based, as this one has been, on imperfect competition can hope to capture in a consistent fashion many key effects of policy changes in such markets. It will be clear from the earlier sections of the paper that we have more confidence in the "Cournot" versions of our model, since it seems to give an appropriate weight to market shares in describing equilibrium. Even this model, however, is at best a crude approximation to the complexity of imperfectly competitive behaviour in the real world.

All of the results reported above are of a partial equilibrium nature in that the analysis is conducted on an industry-by-industry basis. There are three possible important effects which are left out of such an approach. One is the effect of price changes of intermediate goods used as inputs in other industries; the second relates to changes in the prices of primary factors of production as different sectors compete for these factors; and the third is the possible effect of exchange rate changes resulting from the projected changes in trade patterns. We have not modelled such interactions, and our judgement is that including the latter two effects is unlikely to have a major impact on our results: there might be important changes in exchange rates and in factor prices, but the feedback effects into the goods markets are likely to be of second-order importance. The possible effects of intermediate goods price changes are harder to guess without actually developing a formal model that distinguishes between intermediate and final goods, and models the appropriate general equilibrium interactions. It is possible that the omission of such interactions leads to a significant underestimate of the effects of policy change.

What degree of confidence then should one have in our results? Different versions of the model produce fairly similar projections for the EC as a whole and this is encouraging. There is some reason to have greater confidence in our results for the EC as a whole than in our allocation of these results across countries. For example, in the free entry case we see that increased competition causes exit of firms in the EC as a whole, and the consequent changes in firm scale and average costs are very similar for firms in all countries. Which countries does the exit occur in? The results derived by the model come essentially from projection of existing patterns of trade, with the positions of net exporters being strengthened. However, if the actual effect of the reduction in intra-EC barriers was different from the equiproportionate reduction in tariff equivalents that we have modelled, the distribution between countries of the changes in output would be different, and it should be recalled that we have no information on the extent to which the apparent barriers represented by the tariff equivalents are the result of genuine differences in tastes as opposed to potentially removable artificial barriers.

In interpreting the results, one also needs to recall that they have been produced by assuming a reduction of 2.5% in intra-EC trade costs. If one believed that the scope for actual cost reductions were different from this, the projected effects on welfare and costs should be adjusted accordingly. Also we have reported above the figure for the welfare gain as a fraction of trade created, because this figure may remain a reasonable estimate even if trade is created by methods other than the reduction in tariff-equivalent barriers which we have modelled.

We have examined two interpretations of what is involved in "completing the internal market in the EC". The first treated the policy as a quantitative change, involving small reductions in barriers to trade. This change resulted in increased import penetration in each country, so increasing competition, and raising welfare, by modest though significant amounts. Our projections could be rescaled to provide approximate estimates of the effects of barrier reductions of a different size from the one we have modelled.

The second policy change involved a qualitative change in firms' behaviour: forcing firms to act on a European-wide "integrated market" basis, so removing firms' ability to exploit their domestic market power. This policy yields large welfare gains. It also causes large reductions in profit (and in the long run in the number of firms), and it is not clear to what extent there exist feasible changes in EC trade policy and competition policy that could actually being about such a change.

The gains from "completing the internal market" differ substantially therefore according to whether the phrase means simply moving the EC closer to being a true common market, or whether it is to be interpreted as the creation of a genuinely unified market on a scale greater that the U.S.A. The policy implication of our results is that a major aim of EC competition policy should be to remove the sources of price differences between different national markets within the EC. Successful policy of this nature would have more effect on economic welfare in the long run that policies aimed only at barriers more directly and obviously affecting international trade.

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Table 1: Calibration

242 Cement, lime and plaster

Production/Consumption matrix, 1982 mECU.

	Fr	G	It	UK	RoEC	RoW
Fr	1860.32	33.12	7.45	1.97	14.50	114.54
G	4.35	1932.24	0.89	3.19	79.38	68.75
It	1.57	0.32	2138.09	0.02	0.43	41.17
UK	1.20	0.37	0.16	1212.33	4.20	26.14
RoEC	14.52	29.50	2.41	12.59	7369.62	302.66
RoW	0.28	12.73	7.41	1.47	4.76	1208.68

Number of firms=

13	17	19	10	60	10

Number of sub-industries= 1.

Returns to scale.
% increase in average cost at 1/3 output per model: 20%
% increase in average cost at 1/2 number of models: 0%
Linear/loglinear weights; 0.5, 0.5;

Elasticity = 0.6

Cournot Calibration:

Elasticity = 35.54.

Tariff equivalents;

	F	G	It	UK	RoEC
F	0.00	0.19	0.22	0.32	0.15
G	0.27	0.00	0.27	0.31	0.11
It	0.29	0.30	0.00	0.41	0.24
UK	0.28	0.28	0.29	0.00	0.17
RoEC	0.27	0.23	0.28	0.31	0.00

Model Conjectures (%),
w = -6.8 -6.8 -6.8 -6.6 -7.1

Bertrand Calibration

Elasticity = 8.01.

Model Conjectures (%),
w = -6.8 -6.9 -6.8 -6.8 -6.9

257 Pharmaceutical Products

Production/Consumption matrix, 1982 mECU.

	Fr	G	It	UK	RoEC	RoW
Fr	5275.79	164.31	52.71	71.03	167.37	821.89
G	59.10	4914.07	140.17	110.48	266.93	1138.45
It	45.52	67.50	4015.36	20.44	45.82	487.57
UK	84.29	87.27	92.64	3399.65	267.02	1119.32
RoEC	117.47	234.80	71.16	138.07	2016.25	784.49
RoW	237.99	409.20	243.47	206.25	426.09	18558.51

Number of firms=

135	71	88	46	50	298

Number of sub-industries= 5.

Returns to scale.
% increase in average cost at 1/2 output per model: 22%
% increase in average cost at 1/2 number of models: 5%
Linear/loglinear weights: 1.0, 0.0;

Elasticity = 0.8

Cournot Calibration;

Elasticity = 5.8

Tariff equivalents;

	F	G	It	UK	RoEC
F	0.00	0.53	0.64	0.62	0.51
G	0.61	0.00	0.55	0.59	0.46
It	0.61	0.58	0.00	0.69	0.60
UK	0.55	0.56	0.56	0.00	0.42
RoEC	0.49	0.42	0.56	0.50	0.00

Model Conjectures (%),

w =	-0.6	-0.6	-0.6	-0.6	-0.6

Bertrand Calibration

Elasticity = 4.72.

Model Conjectures (%),

w =	17.9	17.9	17.9	17.9	17.9

260 Artificial and synthetic fibres

Production/Consumption matrix, 1982 mECU.

	Fr	G	It	UK	RoEC	RoW
Fr	288.66	81.53	79.05	27.38	80.23	152.95
G	177.92	432.34	175.12	153.30	323.55	649.07
It	100.28	83.25	779.21	67.17	119.26	307.33
UK	6.98	26.63	19.42	822.01	63.62	84.73
RoEC	106.47	186.43	79.47	121.18	612.48	127.15
RoW	90.57	140.18	110.96	172.77	172.38	1524.21

Number of firms=

5	13	10	7	8	15

Number of sub-industries= 1.

Returns to scale.
% increase in average cost at 1/2 output per model; 10%
% increase in average cost at 1/2 number of models; 3%
Linear/loglinear weights; 0.5, 0.5;

Elasticity = 0.5.

Cournot Calibration;

Elasticity = 21.54.

Tariff equivalents;

	F	G	It	UK	RoEC
F	0.00	0.06	0.16	0.28	0.14
G	0.17	0.00	0.17	0.24	0.11
It	0.19	0.10	0.00	0.27	0.16
UK	0.29	0.14	0.24	0.00	0.17
RoEC	0.17	0.03	0.19	0.23	0.00

Model Conjectures (%),

w =	-2.0	-2.1	-2.0	-1.9	-2.0

Bertrand Calibration

Elasticity = 8.71.

Model Conjectures (%),

w =	25.9	30.0	25.9	25.9	25.9

322 Machine Tools.

Production/Consumption matrix, 1982 mECU.

	Fr	G	It	UK	RoEC	RoW
Fr	580.27	88.60	35.87	33.77	57.54	495.95
G	330.86	2456.86	164.38	214.00	350.09	2519.82
It	135.41	123.93	1171.60	46.37	52.12	635.68
UK	49.86	62.82	24.51	758.40	88.77	713.34
RoEC	70.71	132.02	19.81	53.02	621.86	298.21
RoW	298.42	653.72	184.04	358.78	270.74	8899.08

Number of firms=

79	204	115	186	62	556

Number of sub-industries= 1.

Returns to scale.
% increase in average cost at 1/2 output per model; 7%
% increase in average cost at 1/2 number of models; 1%
Linear/loglinear weights; 0.8, 0.2;

Elasticity = 1.1

Cournot Calibration;

Elasticity = 13.55.

Tariff equivalents;

	F	G	It	UK	RoEC
F	0.00	0.13	0.21	0.20	0.18
G	0.15	0.00	0.21	0.18	0.16
It	0.14	0.14	0.00	0.21	0.21
UK	0.19	0.17	0.25	0.00	0.16
RoEC	0.15	0.09	0.24	0.16	0.00

Model Conjectures (%),

w =	0.1	0.1	0.1	0.1	0.1

Bertrand Calibration

Elasticity = 13.25

Model Conjectures (%),

w =	14.3	14.3	14.3	14.2	14.3

330 Office Machinery.

Production/Consumption matrix, 1982 mECU.

	Fr	G	It	UK	RoEC	RoW
Fr	3642.39	392.97	141.28	227.18	242.39	646.68
G	682.03	3022.19	293.57	436.08	433.08	1203.24
It	293.86	208.78	2473.85	168.27	154.96	469.18
UK	387.60	372.85	194.51	1431.41	381.00	990.72
RoEC	317.24	436.91	111.30	551.71	2889.95	665.74
RoW	1434.56	1659.24	551.99	1828.86	1348.03	17123.55

Number of firms=

9	17	6	20	14	70

Number of sub-industries= 2.

Returns to scale.
% increase in average cost at 1/2 output per model; 10%
% increase in average cost at 1/2 number of models; 5%
Linear/loglinear weights; 0.8, 0.2;

Elasticity = 0.90.

Cournot Calibration;

Elasticity = 32.77.

Tariff equivalents;

	F	G	It	UK	RoEC
F	0.00	0.10	0.30	0.10	0.10
G	0.16	0.00	0.28	0.08	0.12
It	0.16	0.11	0.00	0.10	0.14
UK	0.16	0.10	0.28	0.00	0.11
RoEC	0.18	0.10	0.30	0.07	0.00

Model Conjectures (%),
w = -2.4 -2.5 -2.4 -2.5 -2.5

Bertrand Calibration

Elasticity = 10.90

Model Conjectures (%),
w = 40.4 40.3 40.4 40.2 40.3

342 Electric motors, generators, etc.

Production/Consumption matrix, 1982 mECU.

	Fr	G	It	UK	RoEC	RoW
Fr	7106.81	218.95	110.10	90.06	174.80	1361.29
G	449.10	15428.51	247.86	234.17	553.78	2540.48
It	117.51	92.39	2170.80	37.78	51.95	789.58
UK	80.25	96.94	38.02	2219.60	165.41	1516.68
RoEC	105.06	190.88	45.59	88.66	3559.12	548.73
RoW	341.42	794.04	241.08	519.74	445.86	28778.40

Number of firms=

65	186	46	121	53	362

Number of sub-industries= 3.

Returns to scale.
% increase in average cost at 1/2 output per model: 15%
% increase in average cost at 1/2 number of models: 5%
Linear/loglinear weights: 0.8, 0.2;

Elasticity = 1.1

Cournot Calibration:

Elasticity = 7.35

Tariff equivalents;

	F	G	It	UK	RoEC
F	0.00	0.42	0.49	0.48	0.46
G	0.44	0.00	0.48	0.46	0.42
It	0.39	0.40	0.00	0.46	0.47
UK	0.44	0.41	0.50	0.00	0.38
RoEC	0.43	0.36	0.50	0.41	0.00

Model Conjectures (%),

w =	3.0	3.0	3.0	3.0	3.0

Bertrand Calibration

Elasticity = 6.77.

Model Conjectures (%),

w =	27.5	27.4	27.3	27.3	27.3

346 Domestic Electrical Appliances.

Production/Consumption matrix, 1982 mECU.

	Fr	G	It	UK	RoEC	RoW
Fr	2660.24	93.24	67.19	92.58	94.27	226.09
G	286.74	2491.38	93.42	139.34	372.72	594.19
It	260.22	214.14	1539.39	253.44	186.59	429.62
UK	24.03	23.38	8.72	1405.86	77.00	126.91
RoEC	77.06	111.64	8.16	85.64	1635.48	215.76
RoW	187.55	192.49	41.26	200.89	175.59	3290.17

Number of firms=

22	34	27	36	22	42

Number of sub-industries= 5.

Returns to scale.
% increase in average cost at 1/2 output per model: 10%
% increase in average cost at 1/2 number of models: 5%
Linear/loglinear weights: 0.5, 0.5;

Elasticity = 1.75.

Cournot Calibration:

Elasticity = 10.77.

Tariff equivalents:

	F	G	It	UK	RoEC
F	0.00	0.31	0.34	0.34	0.34
G	0.27	0.00	0.33	0.33	0.24
It	0.25	0.23	0.00	0.25	0.27
UK	0.36	0.33	0.40	0.00	0.28
RoEC	0.32	0.25	0.44	0.31	0.00

Model Conjectures (%),

w =	6.5	6.3	6.4	6.3	6.4

Bertrand Calibration

Elasticity = 7.78.

Model Conjectures (%),

w =	62.6	62.0	62.1	61.7	62.3

438 Carpets, linoleum etc.

Production/Consumption matrix, 1982 mECU.

	Fr	G	It	UK	RoEC	RoW
Fr	477.79	27.71	13.91	13.29	25.28	65.02
G	72.31	591.81	34.60	34.27	131.85	237.66
It	45.13	32.70	151.78	18.95	17.32	84.32
UK	19.69	32.58	6.15	969.97	52.50	130.80
RoEC	232.12	382.06	37.02	213.31	3201.47	392.93
RoW	88.15	536.41	65.52	123.87	102.06	4741.82

Number of firms=

25	30	15	52	165	210

Number of sub-industries= 1.

Returns to scale.
% increase in average cost at 1/2 output per model; 6%
% increase in average cost at 1/2 number of models; 3%
Linear/loglinear weights; 0.5, 0.5;

Elasticity = 0.95.

Cournot Calibration;

Elasticity = 21.4

Tariff equivalents;

	F	G	It	UK	RoEC
F	0.00	0.11	0.16	0.17	0.13
G	0.13	0.00	0.15	0.16	0.09
It	0.09	0.08	0.00	0.13	0.12
UK	0.18	0.13	0.22	0.00	0.13
RoEC	0.32	0.25	0.44	0.31	0.00

Model Conjectures (%),
w = 1.0 1.0 1.0 1.0 1.0

Bertrand Calibration

Elasticity = 17.59

Model Conjectures (%),
w = 36.6 36.6 36.5 36.5 36.6

350 Motor Vehicles

Production/Consumption matrix, 1982 mECU.

	Fr	G	It	UK	RoEC	RoW
Fr	22702.28	1342.23	1644.29	858.53	1397.31	4834.67
G	3136.92	23571.78	1988.86	2877.10	4932.93	15737.12
It	1028.58	625.97	8873.40	311.21	333.78	2057.77
UK	478.23	639.63	305.56	10053.23	817.55	3486.90
RoEC	1223.58	2108.70	615.11	1533.90	11507.32	1237.59
RoW	1908.76	1696.23	887.25	1855.49	2618.98	35034.30

Number of firms=

2	5	2	3	2	4

Number of sub-industries= 1.

Returns to scale.
% increase in average cost at 1/2 output per model; 16%
% increase in average cost at 1/2 number of models; 8%
Linear/loglinear weights; 0.5, 0.5;

Elasticity = 1.63

Cournot Calibration;

Elasticity = 13.32.

Tariff equivalents;

	F	G	It	UK	RoEC
F	0.00	0.24	0.32	0.32	0.31
G	0.34	0.00	0.35	0.27	0.25
It	0.30	0.21	0.00	0.31	0.32
UK	0.36	0.22	0.37	0.00	0.28
RoEC	0.32	0.15	0.35	0.23	0.00

Model Conjectures (%),
w = -5.1 -4.6 -4.8 -4.6 -4.8

Bertrand Calibration

Elasticity = 7.2

Model Conjectures (%),
w = 33.0 35.0 33.0 35.0 35.0

Table 2; Reduction in Trade Barriers
Segmented Markets
242 Cement, lime and plaster: (Cournot; models per firm constant)

Production and welfare change by country

	Fixed no. of firms			Variable no. of firms		
	Δ output %	Δ consumers' surplus, mECU	Δ profit mECU	Δ output %	Δ consumers' surplus, mECU	Δ number of firms
France	1.75	12.2	-15.4	2.33	24.0	-1
Germany	-1.01	10.4	-15.2	18.6	51.7	-4
Italy	-0.99	1.7	-3.7	-0.81	9.8	-1
U.K.	-4.0	9.5	-17.4	-2.16	17.9	-1
R of EC	-1.10	10.2	-7.6	-3.66	-8.8	1
EC	0.24	43.9	-59.3	0.58	94.5	-7

EC aggregates

	Δ intra-EC trade %	Δ extra-EC exports %	Δ extra-EC imports %	Δ price% (EC ave)	Δ average costs %	Δ welfare% consumption	Δ welfare% Δ int-EC trad
Fixed no. of firms	128.5	0.4	-10.7	-0.42	-0.03	-0.1	-5.0
Variable no. of firms	180.6	0.0	-33.6	-0.93	-0.93	0.64	22.1

257 Pharmaceutical products: (Cournot; models per firm constant)

Production and welfare change by country

	Fixed no. of firms			Variable no. of firms		
	Δ output %	Δ consumers' surplus, mECU	Δ profit mECU	Δ output %	Δ consumers' surplus, mECU	Δ number of firms
France	0.46	12.3	1.40	0.60	14.4	0
Germany	0.42	19.5	-3.4	0.44	16.8	0
Italy	-0.22	16.2	-8.2	-0.42	7.9	-1
U.K.	0.52	18.3	-6.3	0.30	13.2	0
R of EC	0.68	20.8	-2.7	0.42	17.8	0
EC	0.37	87.2	-19.1	0.30	70.0	-1

EC aggregates

	Δ intra-EC trade %	Δ extra-EC exports %	Δ extra-EC imports %	Δ price% (EC ave)	Δ average costs %	Δ welfare% consumption	Δ welfare% Δ int-EC tra
Fixed no. of firms	13.3	0.0	-2.0	-0.16	-0.08	0.29	21.8
Variable no. of firms	13.3	-0.3	-1.6	-0.15	-0.15	0.30	22.5

451 Footwear

Production/Consumption matrix, 1982 mECU.

	Fr	G	It	UK	RoEC	RoW
Fr	1964.10	107.87	21.51	42.53	102.85	260.93
G	42.76	1238.02	10.22	15.25	126.07	239.68
It	535.04	864.89	1264.14	358.25	446.59	1489.36
UK	10.62	11.01	7.25	1134.15	83.63	94.84
RoEC	20.00	87.31	2.41	30.77	689.88	103.60
RoW	291.47	581.40	78.56	350.28	246.99	4298.87

Number of firms=

94	71	465	65	42	388

Number of sub-industries= 1.

Returns to scale.
% increase in average cost at 1/2 output per model; 2%
% increase in average cost at 1/2 number of models; 2%
Linear/loglinear weights; 0.5, 0.5;

Elasticity = 0.70.

Cournot Calibration;

Elasticity = 53.29

Tariff equivalents;

	F	G	It	UK	RoEC
F	0.00	0.06	0.08	0.08	0.06
G	0.07	0.00	0.08	0.09	0.05
It	0.03	0.02	0.00	0.05	0.04
UK	0.09	0.09	0.08	0.00	0.05
RoEC	0.07	0.04	0.09	0.07	0.00

Model Conjectures (%),

w =	1.3	1.3	1.3	1.3	1.3

Bertrand Calibration

Elasticity = 42.46

Model Conjectures (%),

w =	99.3	99.3	99.3	99.3	99.3

Segmented Markets

330 Office Machinery: (Cournot; models per firm constant)

Production and welfare change by country

	Fixed no. of firms			Variable no. of firms		
	Δ output %	Δ consumers' surplus, mECU	Δ profit mECU	Δ output %	Δ consumers' surplus, mECU	Δ number of firms
France	3.31	112.4	-63.4	-21.3	91.4	-3
Germany	13.4	50.0	10.9	33.6	64.8	3
Italy	4.37	148.9	-113.1	-25.0	129.0	-2
U.K.	-21.3	37.3	14.4	78.9	60.9	11
R of EC	8.24	58.7	-17.3	-11.6	49.7	-3
EC	10.4	407.4	-168.4	12.5	396.0	6

EC aggregates

	Δ intra-EC trade %	Δ extra-EC exports %	Δ extra-EC imports %	Δ price% (EC ave)	Δ average costs %	Δ welfare% consumption	Δ welfare% Δ int-EC tra
Fixed no. of firms	44.5	5.9	-25.9	-1.67	-0.98	0.88	8.0
Variable no. of firms	57.2	12.3	-27.5	-2.48	-2.48	1.45	10.7

342 Electric motors, generators, etc: (Cournot; models per firm constant)

Production and welfare change by country

	Fixed no. of firms			Variable no. of firms		
	Δ output %	Δ consumers' surplus, mECU	Δ profit mECU	Δ output %	Δ consumers' surplus, mECU	Δ number of firms
France	0.09	26.6	-7.0	-0.02	19.9	0
Germany	1.01	22.6	17.3	1.49	46.8	2
Italy	-0.56	19.3	-7.7	-1.98	10.1	-1
U.K.	-0.06	15.7	-1.5	0.04	14.4	0
R of EC	-0.86	30.0	-11.3	-2.26	14.8	-2
EC	0.37	114.2	-10.2	0.31	106.1	-2

EC aggregates

	Δ intra-EC trade %	Δ extra-EC exports %	Δ extra-EC imports %	Δ price% (EC ave)	Δ average costs %	Δ welfare% consumption	Δ welfare% Δ int-EC tr
Fixed no. of firms	17.3	0.1	-2.3	-0.08	-0.05	0.29	19.6
Variable no. of firms	17.9	-0.2	-1.9	-0.09	-0.09	0.29	18.4

Segmented Markets
260; Artificial and Synthetic fibres: (Cournot; models per firm constant)

Production and welfare change by country

	Fixed no. of firms			Variable no. of firms		
	Δ output %	Δ consumers' surplus, mECU	Δ profit mECU	Δ output %	Δ consumers' surplus, mECU	Δ number of firms
France	2.37	18.7	-6.8	-56.3	16.1	-3
Germany	14.6	8.0	11.4	87.9	15.9	10
Italy	1.77	22.7	-14.2	-13.6	21.1	-3
U.K.	-6.71	35.7	-30.7	-21.4	31.9	-2
R of EC	-0.14	20.8	-8.90	-41.7	20.0	-4
EC	4.19	105.9	-49.2	6.61	105.0	-3

EC aggregates

	Δ intra-EC trade %	Δ extra-EC exports %	Δ extra-EC imports %	Δ price% (EC ave)	Δ average costs %	Δ welfare% consumption	Δ welfare% Δ int-EC trade
Fixed no. of firms	20.4	2.0	-24.2	-1.29	-0.51	0.99	13.0
Variable no. of firms	36.9	10.5	-23.2	-2.45	-2.45	1.84	14.0

322 Machine Tools: (Cournot; models per firm constant)

Production and welfare change by country

	Fixed no. of firms			Variable no. of firms		
	Δ output %	Δ consumers' surplus, mECU	Δ profit mECU	Δ output %	Δ consumers' surplus, mECU	Δ number of firms
France	-0.58	16.8	-0.9	-18.4	11.9	-15
Germany	4.1	11.3	13.5	18.6	36.4	38
Italy	-0.02	12.2	-1.0	-4.49	9.7	-6
U.K.	-0.18	13.1	-0.5	-6.47	11.0	-13
R of EC	-2.30	17.8	-2.3	-29.6	8.9	-19
EC	1.67	71.2	8.8	2.66	78.8	-15

EC aggregates

	Δ intra-EC trade %	Δ extra-EC exports %	Δ extra-EC imports %	Δ price% (EC ave)	Δ average costs %	Δ welfare% consumption	Δ welfare% Δ int-EC trade
Fixed no. of firms	27.1	0.3	-8.5	-0.05	-0.12	0.84	13.8
Variable no. of firms	32.0	2.7	-9.4	-0.05	-0.05	0.82	11.4

Segmented Markets
438 Carpets, linoleum etc.: (Cournot; models per firm constant)

Production and welfare change by country

	Fixed no. of firms			Variable no. of firms		
	Δ output %	Δ consumers' surplus, mECU	Δ profit mECU	Δ output %	Δ consumers' surplus, mECU	Δ number of firms
France	-21.2	13.7	-5.8	-52.4	6.4	-15
Germany	11.6	14.6	0.8	32.4	19.2	6
Italy	-0.37	6.2	-1.8	-21.3	4.8	-5
U.K.	-12.0	11.1	-5.6	-18.8	6.3	-15
R of EC	7.66	16.2	2.7	10.6	22.0	11
EC	2.51	62.0	-9.8	2.70	58.8	-18

EC aggregates

	Δ intra-EC trade %	Δ extra-EC exports %	Δ extra-EC imports %	Δ price% (EC ave)	Δ average costs %	Δ welfare% consumption	Δ welfare% Δ int-EC trade
Fixed no. of firms	45.0	1.8	-16.7	-0.30	-0.17	0.67	8.0
Variable no. of firms	53.7	2.3	-17.2	-0.49	-0.49	0.76	7.5

451 Footwear: (Cournot; models per firm constant)

Production and welfare change by country

	Fixed no. of firms			Variable no. of firms		
	Δ output %	Δ consumers' surplus, mECU	Δ profit mECU	Δ output %	Δ consumers' surplus, mECU	Δ number of firms
France	-0.32	11.5	-4.4	-24.1	8.6	-31
Germany	-5.46	12.2	-3.3	-62.7	8.0	-47
Italy	15.9	4.2	4.6	72.0	13.7	311
U.K.	-15.0	10.6	-6.4	-57.2	5.2	-41
R of EC	-12.7	13.3	-4.6	-80.3	7.2	-35
EC	3.21	51.8	-14.0	3.44	42.8	157

EC aggregates

	Δ intra-EC trade %	Δ extra-EC exports %	Δ extra-EC imports %	Δ price% (EC ave)	Δ average costs %	Δ welfare% consumption	Δ welfare% Δ int-EC trade
Fixed no. of firms	41.4	3.8	-21.3	-0.15	-0.03	0.35	3.1
Variable no. of firms	92.7	17.9	-14.7	-0.03	-0.03	0.40	1.6

Segmented Markets
346 Electrical household appliances: (Cournot; models per firm constant)

Production and welfare change by country

	Fixed no. of firms			Variable no. of firms		
	Δ output %	Δ consumers' surplus, mECU	Δ profit mECU	Δ output %	Δ consumers' surplus, mECU	Δ number of firms
France	0.75	33.2	-16.9	-0.44	25.1	-1
Germany	4.32	24.4	-0.4	6.33	28.0	0
Italy	6.40	18.6	0.5	8.89	21.8	0
U.K.	-4.93	20.3	-11.2	-8.14	10.6	-5
R of EC	-0.59	29.2	-13.5	-3.63	20.0	-2
EC	2.09	125.8	-41.6	2.08	105.5	-8

EC aggregates

	Δ intra-EC trade %	Δ extra-EC exports %	Δ extra-EC imports %	Δ price% (EC ave)	Δ average costs %	Δ welfare% consumption	Δ welfare% Δ int-EC trade
Fixed no. of firms	22.1	1.1	-7.6	-0.62	-0.32	0.64	14.8
Variable no. of firms	24.7	0.6	-5.8	-0.93	-0.93	0.81	16.7

350 Motor vehicles: (Cournot; models per firm constant)

Production and welfare change by country

	Fixed no. of firms			Variable no. of firms		
	Δ output %	Δ consumers' surplus, mECU	Δ profit mECU	Δ output %	Δ consumers' surplus, mECU	Δ number of firms
France	2.26	524.9	-315.3	1.36	482.3	0
Germany	5.79	224.5	61.0	10.7	309.4	0
Italy	1.26	307.4	-174.7	-3.10	257.1	0
U.K.	-0.46	234.1	-123.3	-4.76	185.0	0
R of EC	2.72	337.7	-125.6	-1.85	297.7	0
EC	3.36	1628.6	-678.0	3.64	1531.5	-1

EC aggregates

	Δ intra-EC trade %	Δ extra-EC exports %	Δ extra-EC imports %	Δ price% (EC ave)	Δ average costs %	Δ welfare% consumption	Δ welfare% Δ int-EC trade
Fixed no. of firms	18.7	1.2	-13.2	-1.07	-0.56	0.83	17.9
Variable no. of firms	21.2	1.4	-11.7	-1.51	-1.51	1.34	25.5

Table 3: Reduction in Trade Barriers

All Industries (Cournot, models per firm constant)

	Δ output %	Δ average cost %,	Δ welfare% consumption	Δ welfare% Δ int-EC trade
242; Cement, lime and plaster:				
ϵ=35.5, RS=20%, TS=1.6%, H=0.066, DC=0.04%				
Fixed no. of firms	**0.24**	**-0.03**	**-0.1**	**-5.0**
Variable no. of firms	**0.58**	**-0.93**	**0.64**	**22.1**
257; Pharmaceutical products:				
ϵ=5.8, RS=22%, TS=10.0%, H=0.050, DC=0.25%				
Fixed no. of firms	**0.37**	**-0.08**	**0.29**	**21.8**
Variable no. of firms	**0.30**	**-0.15**	**0.30**	**22.5**
260; Artificial and synthetic fibres:				
ϵ=21.5, RS=10%, TS=36.4%, H=0.050, DC=0.91%				
Fixed no. of firms	**4.19**	**-0.51**	**0.99**	**13.0**
Variable no. of firms	**6.61**	**-2.45**	**1.84**	**14.0**
322; Machine tools:				
ϵ=13.6, RS=7%, TS=22.4%, H=0.004, DC=0.56%				
Fixed no. of firms	**1.67**	**-0.12**	**0.84**	**13.8**
Variable no. of firms	**2.66**	**-0.05**	**0.82**	**11.4**
330: Office Machinery:				
ϵ=32.8, RS=10%, TS=23.6%, H=0.120, DC=0.59%				
Fixed no. of firms	**10.4**	**-0.98**	**0.88**	**8.0**
Variable no. of firms	**12.5**	**-2.48**	**1.45**	**10.7**
342: Electric motors, generators etc:				
ϵ=7.35, RS=15%, TS=8.8%, H=0.022, DC=0.22%				
Fixed no. of firms	**0.37**	**-0.05**	**0.29**	**19.0**
Variable no. of firms	**0.31**	**-0.09**	**0.29**	**18.4**
346; Electrical Household Appliances:				
ϵ=10.77, RS=10%, TS=19.6%, H=0.110, DC=0.49%				
Fixed no. of firms	**2.09**	**-0.32**	**0.64**	**14.8**
Variable no. of firms	**2.08**	**-0.93**	**0.81**	**16.7**
350; Motor vehicles:				
ϵ=13.32, RS=16%, TS=24.8%, H=0.199, DC=0.62%				
Fixed no. of firms	**3.36**	**-0.56**	**0.83**	**17.9**
Variable no. of firms	**3.64**	**-1.51**	**1.34**	**25.5**
438; Carpets, linoleum etc.:				
ϵ=21.4, RS=6%, TS=18.8%, H=0.031, DC=0.47%				
Fixed no. of firms	**2.51**	**-0.17**	**0.67**	**8.0**
Variable no. of firms	**2.70**	**-0.49**	**0.76**	**7.5**
451: Footwear*				
ϵ=53.3, RS=2%, TS=27.0%, H=0.010, DC=0.27%				
Fixed no. of firms	**3.21**	**-0.03**	**0.35**	**3.1**
Variable no. of firms	**3.44**	**-0.03**	**0.40**	**1.6**

Table 4: Sensitivity Analysis

	Cournot				Bertrand			
	Models constant		Models variable		Models constant		Models variable	
	Fixed no. of firms	Var. no. of firms	Fixed no. of firms	Var. no. of firms	Fixed no. of firms	Var. no. of firms	Fixed no. of firms	Var. no. of firms
242: Cement, lime and plaster: $\epsilon_C = 35.5, \epsilon_B = 8.0$, RS=20%, TS=1.6%, H=0.066								
Δ EC output %	0.24	0.58			0.00	0.10		
Δ average costs %	-0.03	-0.93			-0.00	-0.01		
Δ welfare%consumption	-0.1	0.64			0.04	0.04		
Δ welfare%Δ int-EC trade	-5.0	22.1			11.1	11.1		
[illegible]7 Pharmaceutical products: $\epsilon_C = 5.8, \epsilon_B = 4.7$, RS=22%, TS=10.0%, H=0.05								
Δ EC output %	0.37	0.30	0.45	0.42	0.22	0.25	0.27	0.27
Δ average costs %	-0.08	-0.15	-0.02	-0.15	-0.05	-0.03	-0.02	-0.03
Δ welfare%consumption	0.29	0.30	0.31	0.44	0.33	0.34	0.36	0.37
Δ welfare%Δ int-EC trade	21.8	22.5	23.1	32.6	29.2	30.1	31.8	32.7
260; Artificial and synthetic fibres: $\epsilon_C = 21.5, \epsilon_B = 8.7$, RS=10%, TS=36.4%, H=0.050								
Δ EC output %	4.19	6.61			1.39	2.74		
Δ average costs %	-0.51	-2.45			-0.17	-0.14		
Δ welfare%consumption	0.99	1.84			1.21	0.97		
Δ welfare%Δ int-EC trade	13.0	14.0			21.4	9.3		
322; Machine Tools: $\epsilon_C = 13.55, \epsilon_B = 13.24$, RS=7%, TS=22.4%, H=0.004								
Δ EC output %	1.67	2.66	2.87	2.79	1.60	2.65	2.92	2.66
Δ average costs %	-0.12	-0.05	-0.05	-0.04	-0.12	-0.02	-0.06	-0.01
Δ welfare%consumption	0.84	0.82	0.86	0.86	0.85	0.83	0.86	0.84
Δ welfare%Δ int-EC trade	13.8	11.4	11.7	12.1	14.2	11.7	11.0	11.9
330; Office Machinery: $\epsilon_C = 32.8, \epsilon_B = 10.9$, RS=10%, TS=23.6%, H=0.12								
Δ EC output %	10.4	12.5	13.3	12.4	2.64	3.80	4.70	4.06
Δ average costs %	-0.98	-2.48	-0.49	-1.95	-0.25	-0.10	-0.24	[illegible].10
Δ welfare%consumption	0.88	1.45	0.62	1.65	0.92	0.98	1.14	1.09
Δ welfare%Δ int-EC trade	8.0	10.7	5.4	13.2	17.1	16.2	15.1	18.2
342; Electric motors, generators, etc: $\epsilon_C = 7.35, \epsilon_B = 6.77$, RS=15%, TS=8.8%, H=0.022								
Δ EC output %	0.37	0.31	0.41	0.46	0.29	0.28	0.30	0.31
Δ average costs %	-0.05	-0.09	-0.02	-0.09	-0.05	-0.01	-0.01	-0.02
Δ welfare%consumption	0.29	0.29	0.31	0.39	0.31	0.31	0.33	0.33
Δ welfare%Δ int-EC trade	19.0	18.4	20.0	24.9	21.7	21.1	22.3	22.5
346; Electrical Household Appliances: $\epsilon_C = 10.7, \epsilon_B = 7.8$, RS=10%, TS=19.6%, H=0.11								
Δ EC output %	2.09	2.08	2.52	3.01	1.29	1.30	1.61	1.55
Δ average costs %	-0.32	-0.93	-0.32	-0.85	-0.20	-0.22	-0.26	-0.21
Δ welfare%consumption	0.64	0.81	0.69	1.37	0.72	0.71	0.79	0.88
Δ welfare%Δ int-EC trade	14.8	16.7	12.2	26.7	20.6	17.7	13.9	21.7
350; Motor Vehicles: $\epsilon_C = 13.3, \epsilon_B = 7.2$, RS=16%, TS=24.8%, H=0.199								
Δ EC output %	3.36	3.64	3.70	5.48	1.71	1.90	3.25	2.42
Δ average costs %	-0.56	-1.51	-0.28	-1.83	-0.29	-0.41	-0.50	-0.41
Δ welfare%consumption	0.83	1.34	0.76	2.56	0.91	0.89	0.82	1.29
Δ welfare%Δ int-EC trade	17.9	25.5	15.5	47.8	25.7	21.7	13.3	32.1
438; Carpets, linolum, etc.: $\epsilon_C = 21.4, \epsilon_B = 17.6$, RS=6%, TS=18.8%, H=0.031								
Δ EC output %	2.51	2.70			1.74	2.21		
Δ average costs %	-0.17	-0.49			-0.12	-0.06		
Δ welfare%consumption	0.67	0.76			0.71	0.74		
Δ welfare%Δ int-EC trade	8.0	7.5			9.5	8.5		
451; Footwear: $\epsilon_C = 53.3, \epsilon_B = 42.4$, RS=2%, TS=27%, H=0.01								
Δ EC output %	3.21	3.44			1.93	2.53		
Δ average costs %	-0.03	-0.03			0.0	0.22		
Δ welfare%consumption	0.35	0.40			0.41	0.38		
Δ welfare%Δ int-EC trade	3.1	1.6			4.0	2.0		

Table 5 Reduction in Trade Barriers
Integrated Markets
242 Cement, lime and plaster: (Cournot; models per firm constant)

Production and welfare change by country

	Fixed no. of firms			Variable no. of firms		
	Δ output %	Δ consumers' surplus, mECU	Δ profit mECU	Δ output %	Δ consumers' surplus, mECU	Δ number of firms
France	-0.59	66.9	-60.8	-4.37	-6.5	0
Germany	2.45	88.3	-76.9	-3.73	-3.8	0
Italy	1.39	33.2	-30.0	0.23	-0.3	0
U.K.	3.76	60.4	-51.7	-3.66	-2.37	0
R of EC	1.13	41.8	-38.4	2.48	9.20	0
EC	1.32	290.6	-257.8	0.03	-14.4	1

EC aggregates

	Δ intra-EC trade %	Δ extra-EC exports %	Δ extra-EC imports %	Δ price% (EC ave)	Δ average costs %	Δ welfare% consumption
Fixed no. of firms	-78.0	0.8	-56.9	-1.81	-0.12	0.22
Variable no. of firms	-43.1	-0.01	5.9	0.09	0.09	-0.1

257 Pharmaceutical products: (Cournot; models per firm constant)

Production and welfare change by country

	Fixed no. of firms			Variable no. of firms		
	Δ output %	Δ consumers' surplus, mECU	Δ profit mECU	Δ output %	Δ consumers' surplus, mECU	Δ number of firms
France	1.19	91.8	-68.4	1.59	33.9	-10
Germany	3.10	182.7	-119.5	1.77	82.0	-10
Italy	3.43	113.0	-75.5	3.46	44.7	-10
U.K.	3.74	234.5	-154.1	-0.41	123.3	-10
R of EC	7.21	104.7	-48.3	5.76	56.5	-5
EC	3.32	726.7	-465.7	2.13	340.3	-47

EC aggregates

	Δ intra-EC trade %	Δ extra-EC exports %	Δ extra-EC imports %	Δ price% (EC ave)	Δ average costs %	Δ welfare% consumption
Fixed no. of firms	-16.1	0.0	-15.7	-2.50	-0.63	1.10
Variable no. of firms	-16.5	-11.5	-7.7	-0.83	-0.83	1.45

Integrated Markets
260; Artificial and Synthetic fibres: (Cournot; models per firm constant)

Production and welfare change by country

	Fixed no. of firms			Variable no. of firms		
	Δ output %	Δ consumers' surplus, mECU	Δ profit mECU	Δ output %	Δ consumers' surplus, mECU	Δ number of firms
France	80.1	74.7	-0.7	33.7	36.4	1
Germany	-52.6	7.4	-41.4	-33.0	-12.8	-3
Italy	13.1	80.2	-34.5	41.7	93.5	-2
U.K.	53.1	132.4	-30.8	21.7	38.0	1
R of EC	30.3	57.4	-8.9	4.63	10.4	1
EC	9.60	352.2	-116.2	7.18	165.6	-1

EC aggregates

	Δ intra-EC trade %	Δ extra-EC exports %	Δ extra-EC imports %	Δ price% (EC ave)	Δ average costs %	Δ welfare% consumption
Fixed no. of firms	-56.5	-2.5	-57.8	-2.60	-1.77	4.14
Variable no. of firms	-48.0	-2.2	-47.5	-1.04	-1.04	2.91

322 Machine Tools: (Cournot; models per firm constant)

Production and welfare change by country

	Fixed no. of firms			Variable no. of firms		
	Δ output %	Δ consumers' surplus, mECU	Δ profit mECU	Δ output %	Δ consumers' surplus, mECU	Δ number of firms
France	0.74	17.8	-1.40	-16.2	12.1	-15
Germany	3.62	12.3	11.6	18.4	36.2	39
Italy	0.98	15.9	-3.4	-5.57	10.0	-10
U.K.	0.32	13.5	-0.90	-5.40	11.0	-12
R of EC	-0.10	19.6	-3.0	-28.2	9.3	-20
EC	2.05	79.1	2.9	2.86	78.5	-18

EC aggregates

	Δ intra-EC trade %	Δ extra-EC exports %	Δ extra-EC imports %	Δ price% (EC ave)	Δ average costs %	Δ welfare% consumption
Fixed no. of firms	24.6	0.3	-10.0	-0.14	-0.16	0.86
Variable no. of firms	29.4	2.6	-10.3	-0.10	-0.10	0.83

Integrated Markets

330 Office Machinery: (Cournot; models per firm constant)

Production and welfare change by country

	Fixed no. of firms			Variable no. of firms		
	Δ output %	Δ consumers' surplus, mECU	Δ profit mECU	Δ output %	Δ consumers' surplus, mECU	Δ number of firms
France	44.2	389.6	-4.5	21.5	187.0	1
Germany	19.5	145.1	-33.0	15.9	94.4	1
Italy	15.3	373.3	-32.6	15.3	361.7	0
U.K.	21.3	59.4	-13.1	20.5	34.1	2
R of EC	33.1	213.5	-43.0	61.0	277.4	-3
EC	27.3	1181.1	-126.2	27.2	954.6	0

EC aggregates

	Δ intra-EC trade %	Δ extra-EC exports %	Δ extra-EC imports %	Δ price% (EC ave)	Δ average costs %	Δ welfare% consumption
Fixed no. of firms	-64.0	11.9	-66.1	-3.23	-2.71	3.88
Variable no. of firms	-51.0	11.7	-68.2	-2.70	-2.70	3.43

342 Electric motors, generators, etc: (Cournot; models per firm constant)

Production and welfare change by country

	Fixed no. of firms			Variable no. of firms		
	Δ output %	Δ consumers' surplus, mECU	Δ profit mECU	Δ output %	Δ consumers' surplus, mECU	Δ number of firms
France	2.21	144.4	-91.6	0.86	54.7	-8
Germany	0.44	62.0	-32.2	1.54	51.4	-3
Italy	4.32	77.4	-42.3	-1.08	29.0	-8
U.K.	1.51	32.3	-14.5	1.09	18.5	-5
R of EC	4.69	105.1	-53.1	0.89	37.2	-8
EC	1.72	421.2	-233.7	1.06	190.8	-32

EC aggregates

	Δ intra-EC trade %	Δ extra-EC exports %	Δ extra-EC imports %	Δ price% (EC ave)	Δ average costs %	Δ welfare% consumption
Fixed no. of firms	2.5	0.4	-8.1	-0.83	-0.26	0.52
Variable no. of firms	4.0	-4.4	-3.8	-1.3	-1.30	0.53

Integrated Markets
346 Electrical household appliances: (Cournot; models per firm constant)

Production and welfare change by country

	Fixed no. of firms			Variable no. of firms		
	Δ output %	Δ consumers' surplus, mECU	Δ profit mECU	Δ output %	Δ consumers' surplus, mECU	Δ number of firms
France	13.6	145.1	-63.3	25.3	185.7	-9
Germany	1.49	81.9	-52.4	4.34	84.7	-14
Italy	-0.81	89.7	-62.6	-0.92	79.6	-13
U.K.	13.6	52.6	-22.3	15.4	46.0	-14
R of EC	20.2	100.5	-34.4	26.4	107.9	-8
EC	8.08	469.9	-234.9	12.7	503.9	-59

EC aggregates

	Δ intra-EC trade %	Δ extra-EC exports %	Δ extra-EC imports %	Δ price% (EC ave)	Δ average costs %	Δ welfare% consumption
Fixed no. of firms	-23.0	2.4	-24.4	-2.88	-1.11	1.79
Variable no. of firms	-24.5	-12.6	-23.6	-9.04	-9.04	3.85

350 Motor vehicles: (Cournot; models per firm constant)

Production and welfare change by country

	Fixed no. of firms			Variable no. of firms		
	Δ output %	Δ consumers' surplus, mECU	Δ profit mECU	Δ output %	Δ consumers' surplus, mECU	Δ number of firms
France	12.5	2172.4	-389.0	54.4	6105.9	-1
Germany	-9.7	555.4	-639.5	-12.3	1551.2	-3
Italy	29.3	914.3	19.6	59.1	2118.9	-1
U.K.	35.5	803.6	-86.4	44.2	1463.0	-1
R of EC	33.0	1353.1	-44.8	57.4	2502.7	-1
EC	10.5	5798.6	-1140.1	26.4	13741.7	-8

EC aggregates

	Δ intra-EC trade %	Δ extra-EC exports %	Δ extra-EC imports %	Δ price% (EC ave)	Δ average costs %	Δ welfare% consumption
Fixed no. of firms	-61.4	2.0	-40.7	-2.58	-1.72	4.09
Variable no. of firms	-61.0	-16.7	-63.5	-16.9	-16.9	12.1

Integrated Markets
438 Carpets, linoleum etc.: (Cournot; models per firm constant)

Production and welfare change by country

	Fixed no. of firms			Variable no. of firms		
	Δ output %	Δ consumers' surplus, mECU	Δ profit mECU	Δ output %	Δ consumers' surplus, mECU	Δ number of firms
France	4.12	21.4	-8.0	-24.2	13.0	-18
Germany	32.9	20.2	-1.1	30.8	21.6	-7
Italy	25.9	11.0	-3.7	-3.73	8.0	-9
U.K.	0.70	20.1	-10.0	-9.67	12.0	-31
R of EC	-3.21	1.0	6.9	7.01	20.7	-43
EC	4.46	73.7	-15.9	4.86	75.4	-109

EC aggregates

	Δ intra-EC trade %	Δ extra-EC exports %	Δ extra-EC imports %	Δ price% (EC ave)	Δ average costs %	Δ welfare% consumption
Fixed no. of firms	26.7	5.9	-24.3	-0.50	-0.30	0.75
Variable no. of firms	34.9	-4.5	-20.2	-2.79	-2.79	0.97

451 Footwear: (Cournot; models per firm constant)

Production and welfare change by country

	Fixed no. of firms			Variable no. of firms		
	Δ output %	Δ consumers' surplus, mECU	Δ profit mECU	Δ output %	Δ consumers' surplus, mECU	Δ number of firms
France	16.4	22.2	-9.7	2.19	18.7	-57
Germany	26.7	17.0	-3.9	-2.58	14.7	-40
Italy	-15.6	-2.1	1.1	12.2	6.0	-36
U.K.	18.2	20.4	-9.6	-7.10	14.5	-46
R of EC	31.9	20.1	-5.6	-6.82	14.9	-29
EC	5.53	77.6	-27.6	4.00	68.7	-207

EC aggregates

	Δ intra-EC trade %	Δ extra-EC exports %	Δ extra-EC imports %	Δ price% (EC ave)	Δ average costs %	Δ welfare% consumption
Fixed no. of firms	-0.1	-1.8	-34.7	-0.50	-0.26	0.46
Variable no. of firms	25.5	-3.2	-25.1	-1.36	-1.36	0.64

Table 6; Integrated Markets

All Industries: (Models per firm constant)

	Cournot				Bertrand			
	Segmented		Integrated		Segmented		Integrated	
	Fixed no. of firms	Var. no. of firms	Fixed no. of firms	Var. no. of firms	Fixed no. of firms	Var. no. of firms	Fixed no. of firms	Var. no. of firms
242: Cement, lime and plaster: $\epsilon_C = 35.5, \epsilon_B = 8.0$, RS=20%, TS=1.6%, H=0.066								
Δ EC output %	0.24	0.58	1.32	0.03	0.00	0.10	0.01	0.02
Δ average costs %	-0.03	-0.93	-0.12	0.09	-0.0	-0.01	-0.0	-0.02
Δ welfare%consumption	-0.1	0.64	0.22	-0.1	0.04	0.04	0.04	0.04
Δ int-EC trade %	128	180	-78	-43.1	22.5	22.5	16.8	16.8
257 Pharmaceutical products: $\epsilon_C = 5.8, \epsilon_B = 4.7$, RS=22%, TS=10.0%, H=0.05								
Δ EC output %	0.37	0.30	3.32	2.13	0.22	0.25	0.24	0.28
Δ average costs %	-0.08	-0.15	-0.73	-3.43	-0.05	-0.03	-0.05	-0.02
Δ welfare%consumption	0.29	0.30	1.11	1.45	0.33	0.34	0.33	0.34
Δ int-EC trade %	13.3	13.3	-16.1	-16.5	11.3	11.3	6.7	6.7
260; Artificial and synthetic fibres: $\epsilon_C = 21.0, \epsilon_B = 8.0$, RS=10%, TS=36.4%, H=0.050								
Δ EC output %	4.19	6.61	9.59	7.18	1.39	2.74	1.43	2.76
Δ average costs %	-0.51	-2.45	-1.77	-1.04	-0.17	-0.14	-0.18	-0.14
Δ welfare%consumption	0.99	1.84	4.14	2.91	1.21	0.97	1.21	0.97
Δ int-EC trade %	20.4	36.9	-56.5	-48.0	15.5	28.8	13.7	27.2
322; Machine Tools: $\epsilon_C = 13.6, \epsilon_B = 13.2$, RS=7%, TS=22.4%, H=0.004								
Δ EC output %	1.67	2.66	2.05	2.86	1.60	2.65	1.60	2.65
Δ average costs %	-0.12	-0.05	-0.16	-0.10	-0.12	-0.02	-0.12	-0.01
Δ welfare%consumption	0.84	0.82	0.86	0.83	0.85	0.83	0.85	0.83
Δ int-EC trade %	27.1	32.0	24.6	29.4	26.8	31.6	26.6	31.3
330; Office Machinery: $\epsilon_C = 32.8, \epsilon_B = 10.9$, RS=10%, TS=23.6%, H=0.12								
Δ EC output %	10.4	12.5	27.3	27.2	2.64	3.80	2.67	3.96
Δ average costs %	-0.98	-2.48	-2.71	-2.59	-0.25	-0.10	-0.26	-0.08
Δ welfare%consumption	0.88	1.45	3.88	3.43	0.92	0.98	0.91	0.98
Δ int-EC trade %	44.5	57.2	-64.0	-51.0	22.8	25.7	17.5	21.0
342; Electric motors, generators, etc: $\epsilon_C = 7.35, \epsilon_B = 6.77$, RS=15%, TS=8.8%, H=0.022								
Δ EC output %	0.37	0.31	1.72	1.06	0.29	0.28	0.30	0.30
Δ average costs %	-0.05	-0.09	-0.26	-1.30	-0.05	-0.01	-0.05	-0.01
Δ welfare%consumption	0.29	0.29	0.52	0.53	0.31	0.31	0.31	0.31
Δ int-EC trade %	17.3	17.9	2.5	4.0	16.2	16.7	14.1	14.6
346; Electrical Household Appliances: $\epsilon_C = 10.7, \epsilon_B = 7.8$, RS=10%, TS=19.6%, H=0.11								
Δ EC output %	2.09	2.08	8.08	12.7	1.29	1.30	1.33	1.38
Δ average costs %	-0.32	-0.93	-1.15	-9.04	-0.20	-0.22	-0.19	-0.16
Δ welfare%consumption	0.64	0.81	1.79	3.85	0.72	0.71	0.72	0.72
Δ int-EC trade %	22.1	24.7	-23.0	-24.5	17.8	20.5	9.5	10.9
350; Motor Vehicles: $\epsilon_C = 13.3, \epsilon_B = 7.2$, RS=16%, TS=24.8%, H=0.199								
Δ EC output %	3.36	3.64	10.5	26.4	1.71	1.90	1.67	1.95
Δ average costs %	-0.56	-1.51	-1.72	-16.9	-0.29	-0.41	-0.27	-0.13
Δ welfare%consumption	0.83	1.34	4.09	12.1	0.91	0.89	0.92	0.9
Δ int-EC trade %	18.7	21.2	-61.4	-61.0	14.3	16.5	0.8	2.7
438; Carpets, linoleum, etc: $\epsilon_C = 21.4, \epsilon_B = 17.6$, RS=6%, TS=18.8%, H=0.031								
Δ EC output %	2.51	2.70	4.46	4.86	1.74	2.21	1.75	2.22
Δ average costs %	-0.17	-0.49	-0.30	-2.79	-0.12	-0.06	-0.13	-0.06
Δ welfare%consumption	0.67	0.76	0.75	0.97	0.71	0.74	0.71	0.74
Δ int-EC trade %	45.0	53.7	26.7	34.8	39.6	46.5	39.1	45.9
451; Footwear: $\epsilon_C = 53.3, \epsilon_B = 42.4$, RS=2%, TS=27.0%, H=0.009								
Δ EC output %	3.21	3.44	5.53	4.0	1.93	2.53	1.93	2.53
Δ average costs %	-0.03	-0.03	-0.26	-1.36	0.0	0.22	0.0	0.22
Δ welfare%consumption	0.35	0.40	0.46	0.64	0.41	0.38	0.41	0.38
Δ int-EC trade %	41.4	92.7	0.0	25.5	37.7	70.6	37.6	70.4

The costs of non-Europe: an assessment based on a formal model of imperfect competition and economies of scale

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TECHNICAL APPENDIX

The model underlying the projections presented in the paper is one of partial equilibrium, operating at the level of a single industry. There are a number of countries, indexed by $i=1,..,I$, in which firms are located, and these countries also constitute separate product markets. Each firm is assumed to be located in only one country and the number of firms active in an industry in country i is denoted n_i, all firms in country i being assumed to be symmetric.

Product differentiation is permitted, and the number of product types produced by a single one of the country i firms is denoted m_i. These products are tradeable, and x_{ij} denotes the quantity of a single product type produced by a firm in country i and sold in country j, at price p_{ij}. In addition to the industries under study, the economy contains a perfectly competitive sector producing a tradeable output under constant returns to scale; this is taken as the numeraire.

Demands in each country are derived from an aggregate welfare function. It is assumed that each country's welfare function is separable between the numeraire commodity and the differentiated products, so that we may construct a sub-utility function over differentiated products, this sub-utility function representing the aggregate quantity of the product consumed. The sub-utility function for country j is denoted y_j, and is assumed to be of the constant elasticity of substitution (CES) form, as in Dixit and Stiglitz [1977]. Consumers in country j may consume products which are produced in each country, so the number of product types available for consumption is $\Sigma n_i m_i$. The sub-utility function, or aggregate volume index, is then

$$y_j=\left[\sum_i a_{ij}^{1/\varepsilon} n_i m_i x_{ij}^{(\varepsilon-1)/\varepsilon}\right]^{\varepsilon/(\varepsilon-1)} (\varepsilon>1, j=1,..,I) \tag{1}$$

where the a_{ij} are parameters describing the preferences of a consumer in country j for products produced in country i. It is then possible to show that the aggregate price level of the product is given by the function

$$q_j = \left[\sum_i a_{ij} n_i m_i p_{ij}^{1-\varepsilon}\right]^{1/(1-\varepsilon)} \quad (j=1,..,I) \tag{2}$$

Demand in country j for the aggregate product is assumed to be a function only of the aggregate product price level and to have constant elasticity of demand μ so that

$$y_j=b_j q_j^{-\mu} \tag{3}$$

where b_j is a parameter measuring the size of the market j, and it then follows that demand for individual product varieties is given by

$$x_{ij}=a_{ij}(p_{ij}/q_j)^{-\varepsilon} y_j=p_{ij}^{-\varepsilon} a_{ij} b_j q_j^{\varepsilon-\mu} \tag{4}$$

Each type of differentiated product is supplied by a single firms and all firms in a particular country are assumed to be symmetric. The profits of a single firm in country i may be expressed as

$$\pi_i=m_i\sum_j x_{ij}[p_{ij}(1-T_{ij})-t_{ij}]-C_i(x_i,m_i)(i=1,..,I) \tag{5}$$

where T_{ij} and t_{ij} are ad valorem and specific costs associated with selling in market j. They may be interpreted either as taxes, or as transport costs. C_i is the firm's production cost function; it is increasing in both output per model, $x_i = \Sigma x_{ij}$, and in the number of model varieties produced, m_i.

In our base case we assume that markets are internationally segmented, so firms may choose sales in each national market separately. Profit maximisation with respect to x_{ij} gives first order conditions of the form

$$p_{ij}(1 - T_{ij})(1 - \frac{1}{e_{ij}}) - t_{ij} = \frac{1}{m_i}\frac{\delta C_i}{\delta x_i} \qquad (i,j=1,..,I) \tag{6}$$

The perceived elasticity of demand, e_{ij}, depends on both the elasticity of demand for a single differentiated product, and the perceived effect of the firm's action on industry aggregate supply. The latter effect depends on the anticipated response of other firms in the industry; if it is anticipated that other firms will hold their price constant when firm i alters its price (the Bertrand hypothesis), then it follows from the equations (5) above that

$$e_{ij} = e_{ij}(B) = \varepsilon - (\varepsilon - \mu)s_{ij} \tag{7}$$

where sij is the share of a single representative firm from country i in market j. If the anticipated response is that other will hold their sales constant when firm i changes its sales (the Cournot hypothesis), then the elasticity is given by

$$\frac{1}{e_{ij}} = \frac{1}{e_{ij}(B)} = \frac{1}{\varepsilon} - (\frac{1}{\varepsilon} - \frac{1}{\mu})s_{ij} \tag{8}$$

(this elasticity being calculated from the inverse demand functions corresponding to equations (5) in which the p_{ij} are written as functions of the x_{ij} and of the y_j.

In some of the cases modelled, it is assumed that in addition to choosing sales of each model, each firm may choose the number of models it produces. If a firm introduces a model, then that model will be sold in all countries. The first order condition for profit maximisation with respect to the number of models is then

$$\sum x_{ij}\left[p_{ij}(1 - T_{ij})(1 - \theta_{ij}) - t_{ij}\right] = \frac{\delta C_i}{\delta m_i} \qquad (i=1,..,I) \tag{9}$$

The form of θ_{ij} depends on two factors. The first is the perceived reactions of other firms. We permit each firm to hold non-zero conjectures about the response of other firms to a change in the number of models produced; that is, if a firm in country i increases the number of models it produces by 1%, then it conjectures that other firms will increase the number of models they produce by w_i%. Second, adding an extra model moves the demand curves for existing models; the value of this depends on whether this shift in demand effects price or quantity of existing models. If the output game is Bertrand, then we assume that price is held constant and quantity changes as new models enter. θ_{ij} is then given by

$$\theta_{ij} = \theta_{ij}(B) = \{(1-w_i)s_{ij} + w_i\}\frac{\varepsilon - \mu}{e_{ij}(B)(\varepsilon-1)} \tag{10}$$

If the output game is Cournot, then we assume that quantities are held constant and price changes as new models enter, and θ_{ij} takes the form

$$\theta_{ij}=\theta_{ij}(C)=\{(1-w_i)s_{ij}+w_i\}\frac{\varepsilon - \mu}{\mu(\varepsilon-1)} \tag{11}$$

This completes the characterization of equilibrium for cases in which the numbers of firms in each country are exogenously determined and markets are segmented. If there is free entry and exit of firms in each country then we have the additional industry equilibrium conditions that profits (equations (5)) are equal to zero.

We also consider a case in which a subset of markets are integrated. In this case firms set a single producer price, although international differnces in consumer prices may remain, because of trade costs. This removes the ability of firms to price discriminate between different markets, and means that each firm has only one degree of freedom in its pricing. If p_i denotes the price charged by a firm from country i in its home market, then export prices, p_{ij} must satisfy

$$p_i(1 - T_{ij}) = p_{ij}(1 - T_{ij}) \qquad (i=1,..,I;j=1,..,K) \tag{12}$$

where the first K markets are integrated, and, for simplicity, we assume that t_{ij}=0. (For a detailed comparison of segmented and integrated markets see Markusen and Venables [1988]).

With this restriction each firm has a single first order condition for its choice of sales in the K integrated markets; equations (8) are replaced by equations of the form

$$p_i(1 - T_{ii})\left[1 - \frac{1}{E_i}\right] = \frac{1}{m_i}\frac{\delta C}{\delta x_i} \tag{13}$$

If behaviour is Bertrand then firms set price p_i given the price of other firms, and the perceived elasticity E_i is a weighted average of the elasticities of demand in the individual markets constituting the integrated market. If behaviour is Cournot, each firms chooses its total sales to the integrated markets given the total sales of the other firms, and each firm's output is divided up between the individual national markets making up the integrated market so as to meet demand, given the fixed price relativities. In this case the elasticity E_i is a complicated expression which is not given here.

There are two further technical points on which further elaboration may be helpful: the choice of functional form of the cost function, and the calculation of "tariff-equivalent" trade barriers.

The literature does not offer clear guidance on the appropriate functional form for the cost function. There are two natural candidates. The first is a linear form (i.e., fixed cost plus constant marginal cost) in which case returns to scale become exhausted as firms become large. The second is log-linear, in which case successive increases in output are associated with continued reductions in average and marginal cost. We employ a weighted average of these functional forms so that costs are given by

$$C(x_i, m_i) = c_i[z\{c_0 + m_i c_m + m_i x_i\} + (1-z)\{m_i x_i^{\alpha}\}^{\beta}] \tag{14}$$

Thus the linear component of the cost function has the weight z, and the loglinear component the weight 1-z. The values of the c_i parameters are selected so that average cost changes with changes in x_i and m_i in ways consistent with the information provided by Pratten [1987].

Finally, a note on the calculation of "tariff equivalents" of observed asymmetries in trade patterns. It follows from (4) that the ratio between expenditure in country j on goods produced in country i and those produced in country j is

$$\frac{p_{ij}x_{ij}}{p_{jj}x_{jj}} = \frac{a_{ij}p_{ij}^{1-\varepsilon}}{a_{jj}p_{jj}^{1-\varepsilon}} \tag{15}$$

The tariff equivalents are calculated simply as the tariff rates by which the prices p_{ij} would have to be adjusted (in addition to the 10% transport cost assumed) to make the observed market shares consistent with $a_{ij}=a_{jj}$.

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CHAPTER 6

Competition and Innovation

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I. INTRODUCTION

This study is designed to assess the likely effects of reducing intra-Community barriers to trade on innovation rates in European industry. It exploits a relatively unique data base on major innovations in the UK, data which is not, unfortunately, available for the other countries of the Community. Although this may limit the generality of the results somewhat, many of the most interesting properties of this data have also been detected in studies on US data. It is not unreasonable, therefore, to treat the results discussed below as creating a presumption which is applicable throughout the Community in the absence of explicit evidence to the contrary.

II. THE POLICY ISSUES AND EXPERIMENTAL DESIGN OF THE STUDY

The evidence suggests that there exist a number of obstacles which inhibit trade within the Community, and there are good reasons to think that removing them (or, at least, ameliorating their effects) may bring substantial gains to all member states. Several policy initiatives have been advanced to tackle these problems in various ways, and there is little doubt that they are likely to improve the allocative efficiency of the internal Community market to some greater or lesser extent. They seem likely to achieve this effect in one or both of two interdependent ways. First, many of the initiatives currently under active discussion will increase the <u>size of the market</u> that firms operate in. For example, both reductions in tariffs and/or non-tariff barriers to trade and new initiatives designed to open transportation services up to more competition will have the effect of reducing transportation costs (considered broadly), and so increase the market area open to a firm producing in any given location. Second, many of the proposed policy initiatives will have an effect on the <u>degree of competition</u> in markets. Thus, moves to strengthen competition policy and to open up public procurement practices are likely to increase the competitiveness of markets, particularly those inhabited by large dominant firms and/or protected "national champions".

Not only is efficiency likely to increase if either type of policy takes effect, but, more importantly, the two types of policy are likely to be mutually reinforcing. Reductions in tariffs and/or transport costs not only increase the effective market area of any particular firm but, by doing so for all firms, they increase the number of effective competitors that any particular firm is likely to face both in newly opened market areas as well as in formerly closed home bases. Similarly, increases in competition which lower prices and stimulate cost reducing or new product innovations are likely to widen existing markets. Such an effect might, perhaps, be expected from a loosening of constraints on defense related public procurement if it leads to a much higher level of technological spillages into the civilian sector, and so to a higher level of new product generation in consumer goods. More prosaically, airline deregulation in the US has made clear the tremendous widening of markets that can be induced by eliminating restrictions on competition.

Thus, the primary effects of reducing intra-community trade barriers will be an increase in market size and in the degree of competition in the newly enlarged market. These changes, in turn, are likely to affect the efficiency of firms and the performance of markets in several important ways. In tracing these effects, it is necessary to distinguish static efficiency, the effectiveness of exploiting given levels of technology, from dynamic efficiency, the effectiveness of efforts to push back technological constraints.

The likely effect of increasing market size and the degree of competition on static efficiency is straightforward, and the only controversy that exists concerns its order of magnitude. As market size increases, whatever limitations that demand may have formerly put upon the realization of scale economies are removed, and firms will be able to move further down their average cost curves. Perhaps somewhat more substantively, increases in the degree of competiton in markets are likely to encourage firms to reduce levels of X-inefficiency, a movement from current cost curves towards the true long run average cost curve. These two effects - movements along a declining cost curve and movements between cost curves - clearly reinforce each other, and lead to an unambigious prediction that costs are likely to fall as market size and the degree of competition increase.

The effects of market size and competition on dynamic efficiency, however, are much less clear. Certainly it seems plausible to believe that increases in market size will increase innovativeness, particularly if there are any economies of scale or fixed costs in the research and development process. However, the effect of competition on innovativeness is rather controversial. In particular, Schumpeterian arguments suggest that at least some degree of monopoly power is conducive to innovativeness, and that large firms are likely to be the most fecund in this respect. If these Schumpeterian assertions are correct, then it is no longer clear that removing obstacles to intra-Community trade will improve dynamic efficiency. Indeed, it is possible that the static efficiency gains arising from such a policy will be more than outweighted by losses arising from a reduction in dynamic efficiency. In short, it appears that a rather crucial step in the argument for opening up internal Community markets is the link between the degree of competition and innovation.

The crux of the matter is clearly Schumpeterian assertions about firm size, monopoly, and the innovativeness of firms. There are, in principle, two types of effect that monopoly power can have on innovative activity: a <u>direct effect</u>, or, the effect that monopoly power has on the response to any given level of expected post-innovation returns; and an <u>indirect effect</u>, or, the effect that monopoly power has on expected post-innovation returns and thence on innovative activity. It is widely believed that the indirect efect of monopoly power on innovation is positive (i.e. that monopoly boosts expected post-innovation returns and so increases innovativeness), but that the direct effect may be negative (i.e. that monopolists respond more slowly than competitive firms to a given level of expected post-innovation returns). If the direct effect is relatively small or if it is positive, then it is hard to dispute Schumpeterian assertions that monopoly power is conducive to innovation. If, on the other hand, the indirect effect is relatively small and the direct effect is negative, then it follows that monopoly inhibits innovativesness and that competition stimulates it. This, of course, would imply that the dynamic efficiency consequences of removing intra-Community barriers to trade will augment and not offset the static efficiency gains that may emerge from such a policy.

Although it seems to be impossible to determine the size much less the sign of the total (direct plus indirect) effect of competition on innovation a priori, it is nevertheless worth exploring the a priori arguments in more depth. Given that indirect effects are likely to be positive (i.e. increasing monopoly or reducing competition increases innovativeness), it turns out to be the case that whether the total effect is positive or negative depends on whether an undoubtedly superior ability enjoyed by large firms with market power is more than offset by the weakening of incentives that market power gives rise to. Appreciating the force of the argument requires an understanding of the several factors which give rise to direct and indirect effects, and we shall consider them in reverse order.

The indirect effect of monopoly on innovation hinges on the effect that current monopoly has on expected post-innovation returns (and, of course, the effect that the latter has on innovative activity). The most straightforward and plausible argument in support of the proposition that the indirect effect is positive is that firms which currently enjoy a substantial degree of market power will be well placed to erect barriers to future entry. This, of course, limits the degree to which rivals can imitate an innovation when it is first introduced, and thus raises the percentage of the total gains to innovating which the initial innovator can appropriate for itself. Hence, because a monopolist is likely to be in a position to appropriate more of the expected gains arising from any given innovation than a more competitive firm can, the monopolist is more likely to innovate.

The second reason to expect a positive indirect effect is much more subtle. Positions of monopoly are, at base, founded on innovations of some sort, and thus the activity of those firms which currently enjoy market power depends upon exploiting their own previous innovations. More competitive rivals and new entrants are likely to be, at best, imitators, and to enjoy only restricted access to the original innovation. Thus, if the results of current innovative activity <u>complement</u> those innovations which have already been made by a firm with market power, then it will gain more from introducing the new innovation than will competitive rivals or new entrants.(1) It follows that if one observes a sequence of complementary innovations, then the whole sequence is likely to have been introduced by only one firm, and, in particular, by the firm which introduced the first innovation in the sequence. Since that act is likely to give rise to at least some monopoly power, then, as a practical matter, one is likely to observe more innovations by monopolists than by competitive firms (ceteris paribus).

The direct effect of monopoly on innovation (that is, the effect of market power on the response to a given level of post-innovation returns) depends upon several offsetting factors. The most controversial element of the argument pits the positive direct effects of various "material advantages" that monopolists may enjoy against several "behavioural disadvantages" that may weaken their performance.(2) Numerous types of material advantage have been suggested in the literature. Economies of scale in research or economies of scope within a portfolio of related research programmes may exist, complementarities between research and marketing may yield important comparative advantages to large firms with well established distribution networks or with advertising skills, and so on. Indeed, many of these advantages spring from the high profits that market power is likely to yield. Access to internal funds weakens a firm's reliance on external credit markets, and this may enable it to operate more flexibly, to take a longer term view, and, perhaps, to act less cautiously than relatively poorly informed financiers may deem prudent.

If they exist, all such material advantages undoubtedly give monopolists the ability to act more innovatively than more competitive firms. Whether monopolists exploit this potential and actual innovate more is another question altogether. The absence of competitive forces may enable managers to indulge in a preference for leisure or allow them to become sleepy. Levels of X-inefficiency may climb, and bureauocratic caution and inertia may come to dominate a firm's activities, paralyzing its creativity and initiative, and atrophing its ability to respond flexibly to events. Thus, market power protects that possess it protects against competitive forces, but, if it is mainly the threat of competition which encourages firms to be innovative and efficient, then market power is likely to give rise to relativley slack behaviour, and so retard innovation rates.

Whether the material advantages of monopoly overcome the possible behavioural shortcomings of monopolists is an open question a priori. There are, however, at least two good reasons to suppose that the direct effect of monopoly on innovative activity will be negative unless the possibly superior ability of monopolists to innovate more than offsets any weaker incentives they may experience. First, a more competitive environment means, inter alia, that more firms are likely to be searching for possible innovations, and this clearly raises the probability of observing an innovation by some time t either because the more firms there are searching, the more likely it is that one of them will find something worthwhile, or because the more there are searching, the harder each will search.(3) Thus, the more competitive a market, the more likely it is that an innovation will be generated.

The second reason for suspecting that direct effects, on balance, may be negative is that monopolists may not only generate less innovations than firms in a competitive market, they may also be less quick in adopting innovations which are produced elsewhere. This possibility arises whenever introducing a new innovation displaces part of the activities of the old one upon which the current monopoly position is based (roughly whenever successive innovations are substitutes). The gain to innovation in these circumstances is the level of expected post-innovation profits net of the profits on current activities which will be displaced by the innovation. Since these latter are likely to be enhanced by monopoly power, it follows that the incentive for a monopolist to adopt new technologies is lower than for a competitive firm not earning excess profits on current activities (ceteris paribus).(4)

Since the indirect effect of monopoly on innovation is likely to be positive, it follows that the persuasiveness Schumpeterian assertions ultimately hinges on the notion that the material advantages of monopolists at least roughly compensate for any behavioural disadvantages or other factors which might weaken the response of a monopolist to profitable innovative activities. By contrast, the anti-Schumpeterian position asserts that the behavioural disadvantages created by monopoly not only overwhelm other positive direct effects of market power on innovation, but also more than compensate for positive indirect effects. In this case monopolists are less likely to innovate than firms in more competitive markets (ceteris paribus), and Schumpeterian assertions must be resisted.

The policy implications of the relationship between competition and innovation are profound, and three are particularly relevant in the current context. First, many of the arguments which have led national governments to centre their public procurement and research activity in the hands of a small number of "national champions" are Schumpeterian in origin. The proponents of these arguments have stressed material advantages which, they have asserted, more than compensate for behavioural disadvantages and other negative factors. If, however, the Schumpeterian argument is invalid then the attractiveness of this type of policy is much attenuated, and more competitive alternatives become important policy options. Second, Schumpeterian assertions have often been used as a caveat to proposals in favour of more vigorous anti-trust activity. What is asserted in such objections is a kind of dynamic economies vs monopoly power trade-off,(5) one that is non-existent if the Schumpeterian hypothesis is invalid. Both a loosening of procurement policies and a strengthening of compeition policy are, of course, part of the broader range of policies discussed in the context of opening up internal Community markets. These are likely to affect both market size and the degree of competition, and the third policy implication of the relationship between competition and innovation is that, if the Schumpeterian hypothesis is correct, then these policies are liable to realize static efficiency gains only at the cost of at least some worsening of dynamic efficiency. If, however, the Schumpeterian hypothesis is invalid, then the static gains to opening up intra-Community markets will understate the total gains to such policies. The attraction of such policies then becomes difficult to resist.

Thus, an examination of the Schumpeterian hypothesis is a major step in the argument in favour of policy initiatives to break down barriers to trade within the Community. In fact, the data provide almost no support for the Schumpeterian position, and thus suggest that there is little reason to believe that a trade-off exists between monopoly power and dynamic efficiency. We shall examine this evidence in two stages. First, in Section III, we explore the relationship between firm size and innovation, and, second, in Section IV, that between the degree of competition and innovation. Section IV also puts the results in a somewhat wider perspective by exploring the interactions between market size, the degree of competition, and innovativeness. Section V summarizes the report.

III. FIRM SIZE AND INNOVATION

Although the Schumpeterian hypothesis is generally considered to be one which relates innovativeness to the degree of competition, it often also appears as a relationship between large firm size and innovation. The two types of arguments are by no means identical, but they are fairly similar at a broad level. The main case made for and against the hypothesized firm size - innovation relationship is generally a variant of the "material advantages" versus "behavioural disadvantages" argument discussed above in connection with direct effects. However, it is also possible to detect at least one indirect effect of firm size on innovation which may be important. Let us briefly consider each type of argument in turn before examining the evidence.

In the first place, size may have an effect on the efficiency with which research inputs process are transformed into the output of innovations. A possible advantage accruing from size is the ability to employ specialised equipment and personnel, and so extend the division of labour in research. In addition, researchers may be more productive when they have more colleagues to interact with, leading to an increased probability that unforeseen results will be recognised as important. Much the same effect may arise when several related research projects are run in tandem. On the other hand, large firms may experience problems in initiating or maintaining their research programme because of internal difficulties in coordinating their activities. This may arise because of the sheer number of successive layers of hierarchy in the firm through which ideas are required to pass. Further, to the extent that it is administration rather than research which tends to offer the most attractive prospects in terms of pay and status in large firms, then the incentives facing talented employees may drive them away from research based activities. Thus, like monopolists, large firms potentially suffer from behavioural shortcomings which must be set against whatever material advantages they can command. The direct effect of firm size on innovation is, therefore, ambiguous.

There is, however, at least one indirect effect which may be positive, since firm size may have an effect on the magnitude of post-innovation returns. The point is simply that the total potential returns to an innovation may be higher the larger is the market to which it is applied, and the returns net of costs can be larger for large firms able to pre-empt most of the total market and spread their fixed costs over a greater sales volume. For example, the potential returns to a process innovation will vary directly with the level of output produced using the process. In perfectly functioning markets, this is not an important issue since innovations can be sold to other firms in the market, thus enabling the innovator to maximize the net gains from research and innovative activity. However, the market in innovations is liable to be an imperfect one, if only because it is frequently difficult for a seller to inform a potential buyer about the nature of the innovation without, at the same time, forfeiting his/her monopoly over the innovation (once a potential buyer knows what it is, there is no need to buy it). Hence, the major gains are likely to come from own use and, in this situation, a large firm may have more incentive to innovate than a small firm.

Most empirical work on this issue has tended to focus on relating the intensity of R & D input, measured either by expenditure or by the employment of research personnel, to firm size measured in various ways. The evidence suggests that R&D intensity tends to rise more than proportionately with firm size initially, but, after some threshold of R&D intensity is reached, it remains constant or even declines. This threshold is likely to vary across industries, but there are indications that it may lie somewhere near the bottom range of Fortune's 500 industrials listing.(6) Although this would seem to suggest that large firms are more innovative, there are, however, at least two reasons for expressing doubt. First, smaller firms generally do not have formal R&D programs and thus their research inputs are not picked up in official R&D statistics. This does not imply that such firms do no research, but rather that official R&D statistics are biased towards measuring the research activities of very large firms. Secondly, there may be systematic differences in the efficiency with which firms undertake a given amount of research, leading to different innovative output rates from a given set of inputs.

Doubts about the relative efficiency with which large firms do research strike at the heart of Schumpeterian assertions about the benefits of large firm size. Direct evidence on this issue not only makes plain some of the hazards of using input data on R&D to measure innovative output rates, but also seems directly germane to the question of whether the direct effects of size are positive (large firm size increases innovativeness) or negative. Certainly the available evidence suggests that, in fact, smaller firms appear to be far more efficient than their larger rivals. For example, investigations of expenditure per patent and of comparable parallel product development efforts undertaken by firms of different sizes reveal that smaller firms incur lower costs, and produce far more output per unit of expenditure. Further, it is often observed that small firms are quicker in bringing new products to the market. They often seem to engineer new products in up to 70 per cent of the time taken by large firms, develop prototypes twice as fast, establish production marginally faster, and start up sales in up to two thirds of the time taken by large firms. Finally, numerous studies suggest that large firms frequently produce rather minor innovations, relying heavily on small firms for ideas which they may improve and develop for commercial applications.[7]

If, as seems to be the case, there is a real danger in using information on R & D inputs to make inferences about the relationship between firm size (or, for that matter, market power) and innovativeness, then it is important to concentrate on work which uses direct measures of innovative output. Our major source of information derives from work done by researchers in S.P.R.U. at the University of Sussex, identifying 4378 major innovations introduced in the U.K. over the period 1945-83. By "major", one means that innovations in this data set have, in general, been deemed to be technically important and commercially successful. Although clearly but a sub-set of the total innovative activity in an economy, major innovations are at least the most important and, in our case, the most visible tip of the iceberg.

Table I shows the proportion of total innovations originating from different sized innovating and ownership units. Column (1) reveals that small and medium sized innovating units make a major contribution to total innovations. For example, 85.3% of all innovations emerged from units of less than 10,000 employees (that is, from firms well below the size of those in Fortune's top 500 list), 48.2% from those with less than 1000 employees and 23.4% from units with under 200 employees. At best, one can observe a very weak U-shaped relationship between size and innovation, but even this does not hide the basic point that smaller firms are responsible for a share of total innovations which far exceeds their share of economic activity measured in terms of sales, employment or value added. In fact, Table I partially conceals a significant rise over time in the share of innovations introduced by units sized less than 1000 employees. This share has more or less steadily risen from 36.7% in 1945-49 to 39.9% (1950-54), 43.4% (1955-59), 40.4% (1960-64), 47% (1965-69), 50.7% (1970-74), 58% (1975-79), and to 59.9% in 1980-83, and has come largely at the expense of the share of firms in the 1000-9999 employees size range.

Although some of the theoretical arguments listed above are more applicable to the size of the innovating unit rather than the whole firm, it is the latter which is the main focus of our interest. Column (2) expresses the size of firms in terms of UK employment, and reveals that firms with less than 10,000 employees accounted for 56.1% of all innovations, firms with less than 1,000 employees for 33.2%, and firms with less than 200 employees for 17%. No matter how one looks at it, small and medium sized firms are clearly responsible for a significant proportion of innovations. What is not apparent from the table is that important changes appear to have taken place over time in the role played by both small and very large firms. In the last three years of the period, 43.2% of innovations emanated from firms with less than 1,000 employees, and 20.7% were accounted for by firms who employ over 50,000 workers. The share of firms less than 200 employees rose from 29.6% in 1945 to 43.2% in 1983, while firms of size 50,000 employees or more accounted for 17.7% in 1945 and 20.7% in 1983.

Table I:
Percent of Total UK Innovations by Size of Unit, 1945-83

	(1) Innovating Unit	(2) UK Ownership Unit
1-199 Employees	23.4%	17.0%
200-999 Employees	24.8%	16.2%
1,000-9,999 Employees	37.1%	22.9%
10,000-49,999 Employees	11.0%	23.0%
50,000+ Employees	3.7%	20.9%

Source: adapted from Pavitt et al, 1987.

Similar results have also emerged from two large scale U.S. studies. Feinman and Fuentevilla (1976) examined 500 important innovations which were first introduced in the U.S. during the period 1953-73. Of the 319 which originated from U.S. firms. 23.5% came from firms with less than 100 employees,23.8% from firms employing between 100 and 1,000, 13.2% from firms with 1,001 - 5000 employees, 5% from firms employing 5001 - 10,000 and the remaining 34.5% from firms with more than 10,000 employees. Edwards and Gordon (1984) studied 8074 innovations introduced into the U.S. in 1982, and found that small firms (less than 500 employees) innovated at about 2.4 times the rate of large firms.

The only conclusion that one can draw from Table I is that if there are any important material advantages to doing research and development, they fail to make themselves plain in the output of the research and development process. Small firms are far more innovative than their relative size would, at first sight, indicate. Of course, this apparently major role played by medium and small sized firms clearly varies by industry, and Table II shows this inter-industry variation for the data on UK innovations. Firms of size less than 1000 employees are important in the Machinery and Instruments industries where they account for more than 45% of all innovations. Firms of more than 10,000 employees, on the other hand, account for more than 75% of all innovations in Mining, Food, Chemicals and Electric Products. In fact, 64% of all small firm innovations are concentrated in Machines, Mechanic Engineering, and Instruments, while 45% of large firm innovations are in Chemicals, Electrical Engineering and Electronics (compared to 27% of all innovations). Thus, small firms not only made an important contribution to overall innovation rates, but often do so in the most innovative sectors.

In short, when one examines the relationship between innovativeness and firm size one finds no substantive reason to think that large firms are, in general, relatively innovative. While looking at crude counts of innovations is not a particularly compelling way to measure material advantages and behavioral disadvantages, they do at least give some useful insight into the net advantages of firm size. Perhaps the most important point to grasp from the evidence is that there apparently exist enormous differences in research efficiency between large and small firms. Because it is more than likely that official R&D statistics drastically understate the critical research inputs typically supplied by smaller firms, these differences in relative efficiency may be somewhat more apparent than real. Nonetheless, the fact of

Table II:

% of TOTAL INNOVATION PRODUCED BY FIRMS OF DIFFERENT SIZE

PRODUCING SECTOR	No. Innovations Produced	1-99	200-999	1,000-9,999	10,000-49,999	50,000+
Agriculture	12	8.3	0	66.7	25.0	0
Mining	126	0	2.4	0.8	12.7	84.1
Food	112	3.6	5.4	9.8	57.1	24.1
Chemicals	421	4.8	7.4	9.7	31.4	46.8
Metals	186	0.5	3.8	25.8	15.1	54.8
Machinery	573	26.2	27.1	33.7	12.4	0.7
Mechanical Engineering	558	14.0	12.0	18.5	38.4	17.2
Instruments	332	31.6	18.1	15.4	16.6	18.4
Electrical Engineering	346	3.2	2.3	4.0	15.3	75.1
Electronics	428	17.5	8.9	12.4	27.3	33.9
Shipbuilding & Offshore Engineering	67	13.4	14.9	46.3	23.9	1.5
Vehicles	212	9.4	8.5	28.8	27.4	25.9
Aerospace	85	2.4	7.1	17.6	29.4	43.5
Textiles, Leather & Clothing	144	20.1	11.8	32.6	6.9	28.5
Bricks, Pottery, Glass, Cement	157	14.0	7.6	18.5	48.4	11.5
Paper	54	16.7	20.4	13.0	38.9	11.1
Printing	29	6.9	34.5	55.2	3.4	0
Rubber & Plastics	91	15.4	27.5	1.1	15.4	40.7

Source: Adapted from Pavitt et al 1987.

matter is that there exists no real presumption that size is a major advantage, except possibly in a few sectors which are probably more the exception than the rule. Size may matter, but it is by no means the case that "big is beautiful".

IV. THE DEGREE OF COMPETITION AND INNOVATION IN MARKETS

The Schumpeterian hypotheses about the determinants of innovation go well beyond propositions about firm size, and assert that an absence of rivalry in markets is also conducive to innovativeness. The argument is controversial because there are, in principle, two channels by which market structure affects the incentives to innovate, and the two can offset each other. Thus, to examine the Schumpeterian hypothesis about the role of market power, one would like to try to separately measure both the direct and the indirect effects of monopoly on innovativeness. The former can be detected in experiments which let industry market structure vary, holding the level of post-innovation returns constant. Indirect effects are rather more complex, since they trace a causal channel from market structure to post-innovation returns, and thence to innovation. Measuring the size of indirect effects, then, requires examining the two partial correlations, and multiplying their effects together. The total, overall effect of monopoly on innovation is simply the sum of the direct and indirect effects.(8)

Thus, we are interested in exploring two particular partial correlations between market structure and innovation. However, such work must be embedded in a full model; to measure these various partial correlations accurately, one must take care to "hold all relevant things" constant. In the context of multiple regression, this means that one must hold constant those factors correlated with the independent variable of interest lest their effects on the dependent variable be confused with those of the independent variable. Practially speaking, this creates a trade-off between the inclusion of irrelevant variables (which can lower efficiency in estimation) and the omission of relevant variables (which can create bias). In the current context, probably the most important factor that one must take account of is variations in "technological opportunity" across industries. "Technological opportunity" refers to the fecundity of an industry's scientific and technological base, to those underlying, dynamic conditions of supply which affect the average productivity of research inputs in producing research output. In the literature, it has been measured in numerous ways. Scherer (1967), Lunn and Martin (1983) and Shrieves (1978) used subjectively chosen dummy variables for certain high technology industries (e.g. life sciences, electronics, aerospace, mechanical and electromechanical engineering, chemicals and so on); Waterson and Lopez (1983) used capital intensity and the rate of growth of net output per head as proxies; Hughes (1984) used data on R&D intensity in the U.S., France, Germany and Japan to indicating technological opportunity in the UK and, finally and perhaps most comprehensively, Levin et al (1985) used six proxies reflecting the sources of technical knowledge, industry maturity, and "closeness" to basic and applied science.

The importance of correcting for variations in technological opportunity across industries arises from the oft made conjecture that industries in which technological opportunity is rich and promising are also industries which are highly concentrated. There are several variants to this argument, not all of which are equally persuasive. One might, for example, think that technological opportunity is enriched by Government defense related research support. Since this is generally channelled to a small number of large firms in highly concentrated industries, it follows that high concentration and technological opportunity will go hand in hand. Alternately, technological opportunity might merely reflect the ease of appropriability, a factor augmented (or, indeed, perhaps created) by strategic investments in barriers to entry made by leading firms in highly concentrated industries. Clearly, for these and other reasons, it seems likely to be the case that failing to correct for technological opportunity may bias the measured effect at least of industry concentration on innovation. The interesting consequence of introducing these various proxies for technological opportunity into regressions of market concentration on research input or output is that they generally cause the effect of industry concentration on innovativeness to diminish considerably, and estimates of this effect tend to become insignificantly different from zero. That is, omission of technological opportunity tends to overstate the effect of industry concentration on innovativeness, creating a distinctly pro-Schumpeterian bias in the results.(9)

Thus, two basic concerns must guide the construction of our empirical model of innovations. First, one must be able to measure both the direct and the indirect effects of market power on innovation, and, as argued above, this requires that we correct for variations in expected post-innovation rates of return. This we shall do by including a variable in the regression measuring post-innovation price-cost margins. Since a zero level of expected post-innovation returns is likely to discourage firms from doing any research whatever the degree of competition, we introduce the profitability variable in log form.(10) Second, one must correct for variations in technological opportunity across industries. The important point to grasp here is that while technological opportunity varies sector by sector, it is roughly constant over time. Hence, for each industry over time, it can be captured by a constant, but only by one that varies in value across sectors. Thus, to correct for variations in technological opportunity, we shall include a full set of industry specific "fixed effects". Finally, to these two concerns we shall add a third. Previous studies of the Schumpeterian hypothesis have focused on the role of market concentration in affecting innovation, hinging the entire test of the Schumpeterian hypothesis on a single partial correlation. This seems to be unduly restrictive, and, in what follows, we shall use six measures of rivalry, looking for a consistent pattern of signs rather than a single positive or negative sign.

Using the data on innovations discussed above, we have conducted tests of the Schumpeterian hypothesis for the U.K., 1970-79. The basic model that we have used is:

$$I_i^* = \tau_i + \alpha_1 \log \pi_i + \alpha_2 M_i + \alpha_3 Z_i + \mu_i \tag{1}$$

where i=1,...,N indexes industries, τ_i = an industry specific constant reflecting i's "technological opportunity", log π_i = the log of post-innovation price-cost margins in industry i, M_i = the degree of monopoly, Z_i = other observable factors affecting innovations, and μ_i is a residual. I_i^* may be positive or negative, and, indeed, if $\pi_i \to 0$ then $I_i^* \to -\infty$. Observed innovations, I_i, are always non-negative and so the data must be described using a Tobit model,

$$\begin{cases} I_i = \tau_i + \alpha_1 \log \pi_i + \alpha_2 M_i + \alpha_3 Z_i + M_i & \text{if } I_i^* \geqslant 0, \\ I_i = 0 & \text{otherwise.} \end{cases} \tag{2}$$

If $\alpha_1 > 0$, then expected post-innovation returns stimulate innovation. Holding log π_i constant enables one to observe the direct effect of monopoly on innovativeness, α_2; the indirect effect is α_1 times the effect that monopoly, M_i, has on π_i or, equivalently, log π_i.

To estimate the N+4 parameters in (2), one needs to use panel data (i.e. a times series of cross-sections). The advantage of panel data is that tracking a single cross-section unit, i, over time enables one to estimate τ_i, and also enables one to bring more informatin to bear to the task of estimating all the parameters of (2) more efficiently. We have used two cross section samples of 73 M.L.H. (or, three digit) industries for 1970-74 and 1975-79 respectively.(11) The dependent variable is the number of innovations introduced in each of the two five year periods.

For the Z_i, we have used five variables: the growth of industry sales ($GROW_i$), industry size measured as the log of industry capital stock ($SIZE_i$), the average industry capital output ratio (KAP_i), industry export intensity ($EXPORT_i$), and industry unionization measured as the percentage of the workforce covered by collective agreements ($UNION_i$). These variables are included to correct for omitted factors whose effects might otherwise mistakenly be attributed to market power, and were chosen for inclusion on the basis of previous appearance in the literature and a suspected correlation with the various measures of rivalry.

Finally, we were able to measure various dimensions of competition and rivalry in markets much more extensively than hitherto. The six measures that we have used are: industry concentration (CON_i), the percentage change in industry concentration within the period (ΔCON_i), industry import intensity ($IMPORT_i$), the gross share of sales by new entrants and by exitors ($ENTRY_i$ and $EXIT_i$), and the relative number of firms sized 99 employees or less ($SFIRM_i$). If rivalry stimulates innovativeness, then one expects to see IMPORT, ENTRY, and SFIRM positively correlated to innovativeness, and the other three negatively correlated; the Schumpeterian hypothesis that market power is conducive to innovation predicts exactly the opposite pattern of signs. Thus, if the coefficients on CON, ΔCON and EXIT are negative while those on IMPORT, ENTRY and SFIRM are positive, we conclude that market power has a negative direct effect on innovation. If, on the other hand, one observed CON, ΔCON and EXIT to have positive correlations with innovativeness and IMPORT, ENTRY and SFIRM to have negative ones, then this suggests a positive direct effect and, almost surely, evidence in support of the Schumpeterian hypothesis. Any other pattern of signs is uninformative on the hypothesis of interest.

Table III shows the results of this test. The estimating equation is

$$I_i = \theta_0 + \theta_1 * \log\pi_i + \theta_2 * CON_i + \theta_3 * GROW_i + \theta_4 * SIZE_i + \theta_5 * \Delta CON_i + \theta_6 * KAP_i + \theta_7 * IMPORT_i + \theta_8 * ENTRY_i + \theta_9 * EXPORT_i + \theta_{10} * SFIRM_i + \theta_{11} * EXIT_i + \theta_{12} * UNION + \mu_i \tag{3}$$

The estimates reported in columns (i) and (ii) are OLS and Tobit estimates of (3), and provide evidence which is clearly inconsistent with the notion that there is a positive direct effect of actual monopoly on innovativeness. θ_2 is negative and significantly different from zero, θ_8 positive and nearly significant, θ_{10} positive and clearly signficant, θ_{11} negative and significant and θ_5 negative and significant. Only θ_7 is clearly insignificant, and it is also the only variable whose coefficient breaks the essentially anti-Schumpeterian pattern displaved on Table III. It therefore seems to be the case that highly concentrated industries and those in the

6.30

TABLE III

Regression results for equation (3)

Independent Variables	(i)	(ii)	(iii)	(iv)
$\log\pi_i$	4.204	1.16	1.70	2.85
	(.8917)	(.176)	(.295)	(.438)
CON_i	-50.87	-57.570	.824	-77.10
	(3.05)	(2.274)	(.960)	(2.44)
$ENTRY_i$	31.864	18.51	-2.512	85.07
	(1.94)	(1.05)	(.597)	(2.21)
$IMPORT_i$	-2.137	-3.80	-1.902	11.08
	(.239)	(.122)	(-1.60)	(.545)
$SFIRM_i$	12.462	3.165	-1.22	9.281
	(2.131)	(1.09)	(.886)	(1.028)
$EXIT_i$	-18.025	-26.171	.775	-56.29
	(2.207)	(-1.38)	(.225)	(1.59)
ΔCON_i	-7.688	-9.734	-.078	-9.631
	(2.238)	(2.02)	(.073)	(1.22)
$SIZE_i$	.0709	4.271	1.22	-1.701
	(.016)	(.625)	(3.932)	(.182)
$GROW_i$	2.296	3.44	.668	-.879
	(2.06)	(1.91)	(1.44)	(.328)
$KAYO_i$	.906	.835	-.366	2.642
	(1.75)	(1.25)	(3.17)	(1.38)
$EXPORT_i$	4.008	6.987	4.64	-.1515
	(.916)	(.883)	(3.27)	(.019)
$UNION_i$	-7.77	-2.61	.243	-29.94
	(1.76)	(.489)	(.135)	(3.34)
LogL	-392.58	-309.823	-64.2955	-278.283

Notes to Table III

All the equations include fixed effects; t-values (in absolute value) are given in brackets below estimated coefficients. The definition of the variables is: I_i = number of innovations; CON_i = 5 firm concentration ratio; $GROW_i$ = % change in domestic production over the period; $SIZE_i$ = log of industry capitalstock; $DCON_i$ = % change in industry concentration; $KAYO_i$ = capital-output ratio; $IMPORT_i$ = imports as a % of sales; $ENTRY_i$ = market share of entrants in year of entry; $EXPORT_i$ = exports as a % of sales; $SFIRM_i$ = No. firms ≤99 employees as a % of total number of firms; $EXIT_i$ = market share of exiting firms in the year of exit; $UNION_i$ = % workforce covered by collective agreements; and $\log\pi_i$ = expected post-innovation price-cost margins. Column (i) presents an estimate of equation (3) using OLS. Columns (ii) and (iii) are Tobit and Probit estimates of the same equation, while column (iv) shows the regression in column (i) applied to the sample of industries for which $I_i>0$, with an appropriate censored sample bias correction.

process of becoming more concentrated are less innovative than more competitive looking ones. There is also a noticeable tendency for this to be true in industries subject to high entry rates, low exit rates, and in industries which have a large small firm sector. The effect of import competition on innovativeness is negligible.

The sign pattern of the remaining six variables contains few surprises. θ_{11}, the coefficient on log π_i, has a positive effect on innovativeness, but one that is extremely difficult to estimate with precision. Industry size (θ_4), export intensity (θ_9), and unionization (θ_{12}), all appear to be relatively unrelated to innovativeness, while growth (θ_3) and capital intensity (θ_6) are positively associated with innovativeness (albeit weakly). As remarked above, these variables have, in the main, been included in order to avoid generating any bias in the estimates of θ_2, θ_5, θ_7, θ_8, θ_{10} and θ_{11}. However, it is worth noting that they do suggest that market size per se has no apparent effect on innovativeness, although, as expected, high growth rates seem to go hand in hand with more innovations.

The results on Table III are extremely robust to a wide range of respecifications. They are more or less invariant to quite substantial changes in the specification of (the log of) post-innovation returns. Use of rates of return on capital rather than price-cost margins, specifying returns in terms of levels and not logs, and use of a rational expectations proxy for expected post-innovation returns rather than actual, observed returns all had little effect. The results are also quite insensitive to changes in the vector of exogenous variables. Dropping any one or any subsample produced very little effect on the remaining estimated coefficient, although t-statistics often increased. Since it is reasonable to argue that many of the six rivalry variables may be caused by innovations, tests on the exogeneity of those six variables - collectively, singly and in groups - were performed. In all cases, the null hypothesis that they are exogenous to the process generating innovations could not be rejected. The only variable for which these tests were at all close to rejecting that null was the level of industry concentration, CON_i. Two stage least squares estimates allowing CON to be endogenous produced an estimate of its coefficient which was somewhat more negative than those displayed on Table III, indicating that the estimates of this coefficient reported on Table III are biased upwards if they are biased at all. Finally, estimating the model (3) across the two cross-sections taken separately (and neglecting the fixed effects) yielded virtually identical results for each taken separately.

Columns (ii)-(iv) on Table III show further experiments with the regression reported in (i). Since about 25%-30% of the industry 5-year periods reported no innovations, then (i) is, in principle, liable to be affected by a censored variable bias. A Tobit estimator is appropriate for situations such as this, and Tobit estimates of (i) are shown as (ii) on the Table. Clearly nothing of substance is affected by reestimating the model in this manner, although small biases are present. The Tobit model itself is, however, rather restrictive, for it assumes that the determinants of limit observations (I_i=0) are identical to the determinants of the density of non-limit observations, (I_i given that I_i>0). One can relax this assumption in a number of ways, but one of the simplest and most straightforward is the so-called "double hurdle" model.(12) This is a two equation model in which the first step is a Probit estimate determining whether or not inovations occur (I_i=0 or I_i>0), and the second step is an OLS estimate determining the number of innovations that occur given that at least one is reported. The rationale behind the model is straightforward. and hinges on there being effects conveyed through the independent variables which affect the ability to innovate ($I_i=0$ or $I_i>0$) in a manner which differs from the intensity of innovation given that innovation occurs at all (I_i given $I_i>0$). These equations are shown as (iii) and (iv) respectively on the Table. The Probit estimates suggest that the degree of competition has very little effect on the probability that an innovation will occur, but the estimates in (iv) show that competition increases - and monopoly power reduces - the number of innovations introduced given that at least one is introduced. Thus, it appears to be the case that monopolists are not so much less likely to innovate as they are less likely to do so more intensively than firms in more competitive sectors.

The estimates on Table III also cast some interesting light on the role played by "technological opportunity" in accounting for inter-industry variations in innovativeness. It is plausible to think that the conditions of technological opportunity are correlated with many of the twelve independent variables that we have used in the regressions on Table III. A regression of the estimated values of the fixed effects on the twelve independent variabless produced an R^2 slightly in excess of 50%. The results (not shown) suggest that industries with high technological opportunity are not only to be highly concentrated, but are also large, not very highly capital intensive, and rather more profitable than the rest. Given this, it is not very surprising to discover that failing to correct for variations in technological opportunity across industries (acheived by suppressing the fixed effects and forcing each industry to have the same intercept) leads to substantial bias. In particular, doing this makes concentration appear to be positively (but not significantly) correlated to innovations, and to make both market size and expected post-innovation profits positively and significantly correlated to innovations. Large, profitable and highly concentrated markets appear to be more progresive, but this seems to be more or less entirely due to the fact that they have a richer "technological opportunity" than other sectors. Correcting for technological opportunity makes it plain that market size and profitability have little systematic effect on innovations, and that highly concentrated industries are significantly less progressive than the rest. Finally, a decomposition of the R^2 statistics for (1) on Table III suggests that variations in technological opportunity taken alone account for at least 60% of the variation in innovations, while the twelve observables in (2) account, at best, for about 30%. Thus, technological opportunity appears to play a major role in explaining inter-industry variations in rates of innovation.

Thus far, we have established that the direct effects of monopoly power on innovation are negative; that is, that monopolists respond more slowly and less sensitively to a given level of expected post-innovation returns arising from any given innovation than more competitive firms. However, it is possible that these negative direct effects partially or, indeed, more than offset by positive indirect effects, leading to a positive total effect of monopoly on innovation. Thus, the next step is to calculate the indirect effects of monopoly on innovation.

To calculate the indirect effect of monopoly on innovation, one needs to know how post-innovation returns are affected by monopoly, and how they affect innovative activity in turn. Estimates of the latter (i.e. θ_1) are shown on the first row of Table III, and are invariably positive but not significant. To estimate the effects of monopoly on post-innovation profits, one needs to estimate an equation of the form

$$(4) \qquad \log \pi_i = \emptyset_i + \emptyset_1 I_i + \emptyset_2 M_i + \emptyset_3 W_i + \varepsilon_i,$$

where $\log \pi_i$ = the log of actual price-cost margins, and the W_i are other exogenous variables. Using (4), the indirect effect of monopoly on innovation is $\emptyset_2\theta_1$. We have specified (4) to include all twelve independent variables in (3), and also have included several further variables to identify the two equation system, (3)-(4). Table IV shows the results of these calculations. The first column is an estimate of (4), and, using (ii) on Table III, is combined to give an estimate of the total effect of monopoly on innovation in column (ii). Thus, for example, the direct effect of ENTRY is (from (ii) on III) 18.51; the indirect effect is (1.16) × (-.838) = -.972, and thus the total effect is = 17.54.

Table IV tells a very simple and straightforward story. Equation (i) shows that rivalry (i.e. low CON, high ENTRY, high IMPORT, high SFIRM, low EXIT, and high ΔCON) reduces price-cost margins, ceteris paribus. Thus, for an innovation which yields a given total of potential profits, one expects to observe monopolists appropriating more of it than would be managed by firms in more competitive sectors. And, since this higher realized profit has a positive (if statisticlaly weak) effect on innovativeness, it is clearly the case that the indirect effect of monopoly on innovation is positive. Since Table III suggests that the direct effects are negative, the size and sign of the total effect of monopoly on inovativeness is uncertain. Putting together the estimates on Tables III and IV, it is clear that the trade-off which exists in principle does not amount to much in practice. In virtually every case, the sign of the total effect of a variable on innovation is the same as the sign of its direct effect computed by holding unexpected post-innovation returns constant. What is more, in most cases the sizes of the direct and effects are virtually the same. Thus, one concludes that the indirect feedback from market structure (and other variables) to innovation is weak and extremely uncertain in effect. The negative direct effects shown on Table III clearly suggest that monopolists are slower to respond to profitable innovative opportunities than are firms in more competitive markets; the very small indirect effects revealed on Table IV suggest that there is absolutely no systematic tendency for the higher post-innovation returns that monopolists appear to enjoy to compensate for their relative weaker response to such opportunities.

Thus, it seems plain that there is virtually no evidence whatsoever in the data which support the view that monopoly or market power is conducive to innovative activity. Opening up most markets to more competitive forces - lowering industry concentration, raising net entry rates, and sustaining a large and vibrant small firm sector - seems likely to have a positive and healthy effect on innovative activity.

One might reasonably ask, however, what the longer run effects of innovative activity is likely to be. In particular, will higher levels of innovative activity make markets even more competitive, or does innovation have a centralizing effect on the structure of markets? If it is the case that innovation is decentralizing and so increases

TABLE IV

Regression results for equation (4)

	(i)	(ii)
CON_i	.323 (.270)	-58.919
$ENTRY_i$	-.838 (2.56)	17.54
$IMPORT_i$	-.0049 (.017)	-.412
$SFIRM_i$	-.260 (1.87)	3.37
$EXIT_i$	.445 (1.48)	-24.93
ΔCON_i	-.102 (1.20)	-10.241
$SIZE_i$	-.239 (1.71)	3.698
$GROW_i$	-.056 (1.81)	3.333
$KAYO_i$	-.017 (1.30)	.816
$EXPORT_i$	.020 (1.39)	6.885
UION	.040 (.234)	-2.52

Equation (i) has the log of price-cost margins as its dependent variable and also includes fixed effects, risk, an instrument for innovations, concentration squared and size squared. Column (ii) is the total effects computed from (i) and (ii) on Table III. Indirect effects for CON were computed at sample mean values, $\overline{CON}$ = .517.

competition in markets, then the basic relationship between competition and innovation that we have identified is mutually reinforcing. Competition breeds innovative activity which, in turn, increases the degree of competition. If this is the case, then policies designed to increase the size of markets and increase competition will have a long run effect in excess of their short run effect. If, on the other hand, innovation is centralizing, then such policies will increase competition and innovativeness only in the short run. As the process gets under way, the increase in innovative activity will counteract the initial effects of the policy. Long run effects will be less than those observed in the short run and, indeed, may ultimately completely offset the initial policy actions. Thus, before finally concluding that competition stimulates innovativeness, one must check to see that short run effects do indeed persist.

To explore this question, one needs to know something about the feedback from innovation to market structure. The work on Table III uses, six measures of market structure or its changes, but most interest focuses on industry concentration. Hence, we shall specialize the question somewhat, and ask whether innovative activity tends to concentrate or deconcentrate markets.(13) The simplest and most straightforward way to investigate this question is to use a dynamic model which distinguishes short from long run movements in market concentration, and allows for partial adjustment to changes in the latter. The model was estimated across the same 73 industries in the two five year time periods 1970-74 and 1975-79 as the regressions reported on Table III, and yielded the estimated equation

$$(5) \quad \Delta CON_t = \underset{(23.28)}{-1.083}\, CON_{t-1} + \underset{(3.67)}{.0056}\, KAYO_t - \underset{(2.51)}{.003}\, SIZE_t$$

$$+ \underset{(1.08)}{.0035}\, \Delta KAYO_t + \underset{(.690)}{.0149}\, \Delta SIZE_t - \underset{(3.59)}{.0011}\hat{I}_t$$

plus industry specific fixed effects ($\bar{R}^2 = .71$), where $\hat{I}_t$ is an instrument for I_t, and where now $\Delta CON_t = CON_t - CON_{t-1}$, and similarly with $\Delta KAYO_t$ and $\Delta SIZE_t$. It is plain from (5) that innovations have a clear, statistically significant negative effect on market concentration, and thus that an increase in innovativeness will reduce long run levels of concentration. Further, the partial adjustment parameter implies that the effect of this change in long run concentration levels will be fully incorporated into actual, observed levels of market concentration largely within "the period" (i.e. within about five years). Like those reported on Tables III and IV, the results reported in (5) are extremely robust. Letting I_t be endogenous or lagging it had no substantive effect on the results, and, similarly, the inclusion or exclusion of $SIZE_t$, $KAYO_t$, $\Delta KAYO_t$ and $\Delta SIZE_t$ singly or in groups had no real effect.

Combined with the estimates of (3) reported above, (5) suggests that increases in competition and in innovative activity are mutually reinforcing. A competitive market produces more innovations than a more monopolistic one, and the result of this innovative activity is to make markets more competitive. Hence, over time one expects to observe a gradually increasing spiral of innovation and decreases in market concentration (all other factors held constant), decreases which will further boost innovation rates. Clearly a one-off increase in competition, say as the result of policy initiatives to reduce intra-Community barriers to trade, will hasten this evolutionary process, and produce long run effects in excess of those observed in the short run.

One final set of remarks is in order. While it is clear that the degree of competition has an effect on innovative activity (and one that feeds back on itself) it is less than clear that market size per se has any impact on innovation. It appears to be true that markets which are rich in technological opportunity are also frequently rather large, but it is plain from Table III that once variations in technological opportunity across industries is held constant, then size per se plays very little role in affecting innovation rates. Whatever importance market size has is indirect, operating only to the extent that large markets are less concentrated, attract more entry, and so on. Regression (5) suggests that, at least with respect to movements in industry concentration, the effect of increased market size is minimal. Other studies in the literature have reported positive effects of size on entry rates and significant negative effects on concentation, but most studies seem to suggest that these effects are small.(14) One emerges with the clear feeling that initiatives to open up the internal Community market will have a positive effect on rates of innovation only to the extent that they increase competitiveness. Measures aimed solely at increasing market size without affecting the degree of competition are unlikely to produce a discernable impact on dynamic efficiency.

V. SUMMARY

The basic argument and results of this paper are as follows.

(1) Recent policy measures proposed in the context of efforts to reduce intra-Community trade barriers are likely to affect both the size of and the degree of competition in markets;

(2) increases in market size are likely to yield static efficiency gains if economies of scale exist, and increases in the degree of competition will reinforce this to the extent that they lead to a reduction in X-inefficiency.

(3) In principle, increases in market size ought to stimulate innovativeness and raise the dynamic efficiency of markets;

(4) however, increases in the degree of competition could lead to a reduction in innovativeness to the extent that large firm size and market power are necessary for innovation.

(5) The data reveals that there are no obvious advantages to firm size or to market power in generating innovative activity in the short or in the long run.

(6) It follows that moves to open up internal markets within the Community are unlikely to lead to any important trade-offs between the realization of static and dynamic efficiencies. The static gains to such policy proposals almost certainly understate the total gains to be realized from their implementation.

Notes

1. This argument follows Gilbert and Newberry, 1982. If the initial monopoly is based on an innovation then, if it introduces a second innovation, the monopolist can coordinate the pricing of the goods associated with the two innovations. If, by contrast, an entrant introduced the second innovation, then competition would prevail between the two goods. The returns the entrant would earn are, therefore, less than the returns that the monopolist would get if it introduced both goods, and this means that the monopolist would have a greater incentive to introduce it, pre-empting the entrant.

2. The terms are due to Rothwell (1985); the debate that follows in the text is discussed at greater length in Scherer (1980, pp.423-38).

3. This has been extensively discussed in game theoretic models of R&D; see, amongst others, Scherer 1967, Loury 1979, and Reinganum 1982; for good surveys, see Kamien & Schwartz, 1982, and Dasgupta, 1986.

4. This is the well known argument of Arrow, 1962; Fellner, 1951, also stressed that the foregone profits from the displaced line of activity can act as an opportunity cost slowing down the introduction of the new innovation.

5. On the standard, static efficiency vs. monopoly power trade-off which is caused by economies of scale, see Williamson (1968).

6. For good surveys, see Scherer (1980) or Kamien and Schwartz (1982); Fisher and Temin (1973) critically discuss how much can be inferred about the Schumpeterian hypothesis from regressions of firm size on R&D inputs.

7. In addition to Scherer (1980) and Kamien and Schwartz (1982), see also Ergas (1984). In a recent study in the UK, Schott (1977) discovered that many large firms aim for extremely modest technical advances whose value depreciates extremely rapidly.

8. Previous work in the literature has concentrated on simple partial correlations between market structure (as measured by concentration ratios) and measures of research inputs or innovative output, and have interpreted a positive correlation between the two as evidence consistent with the Schumpeterian hypothesis. Since this correlation does not measure either the direct or the indirect effect of monopoly on innovation, it is a little difficult to interpret. For surveys of this literature, see Kamien and Schwartz (1982) or Scherer (1980).

9. See, for example, Phillips (1966), Scherer (1967); Cohen et al (1987) find much the same effect in firm size and R&D regressions.

10. We also tried using rational expectations proxies of post-innovation returns rather than observed post-innovation returns, but no significant differences emerged from this. The rational expectations proxy for expected post-innovation profits used a two equation structural model of profits and innovations to derive a reduced form expression linking profits to all the

exogenous variables in the system. Assuming that agents possess rational expectations, one can then use the predictions from this reduced form equation to proxy expectations, since these predictions are exactly what a rational agent who knew the structure of the model would use (for further discussion of the econometric issues associated with rational expectations models, see Wallis (1980) and Wickens (1982)).

11. The innovations data base only provides 80 possible MLH industry classifications, and 7 further industries were eliminated because of holes in our capital stock series. Five year intervals were chosen to minimize the effect of any inaccuracies in recording the precise date of innovation.

12. For a good discussion of limited dependent variable models, see Maddala (1983); Blundell and Meghir (1987) discuss the "double hurdle" model.

13. We have done some simple reduced form regressions which indicate that increases in innovation increase entry and exit at a diminishing rate, and reduce imports, small firm activity and percentage changes in market concentration at a diminishing rate. None of these effects appear to be strong or significant.

14. See Geroski and Masson (1987) and Curry and George (1983), respectively, for surveys of these studies.

Data Appendix

I_i = number of major commercially successful innovations used in industry i. this data is based on a major study by SPRU, Univesity of Sussex, of 4378 major innovations in the U.K., 1945-83; for details see Townsend, 1981, and Robson and Townsend, 1984. The data was obtained from the ESRC Data Archive at Essex.

π_i = price-cost margins, defined as net output less the wage bill less net capital expenditure divided by gross output. Data was obtained from the Census.

DCON and CON_i = percentage change and level of the 5-firm concentration ratio, from the Census of Production.

$ENTRY_i$ and $EXIT_i$ = market share of all new (exiting) firms. The data was drawn from a special compilation made by ENTRY and EXIT for the 1980-74 period were measured by 1974 values of the variables since data for 1970-73 was not available.

$IMPORT_i$ and $EXPORT_i$ = import and export intensity, obtained from the DTI via the MICRODATA data based compiled at the OECD. this data is virtually the same as is available in the Business Monitor.

$SFIRM_i$ = relative number of firms ≤99 employees, from the Census. One or tow missing observations were filled using Order averages.

$SIZE_i$ and $KATO_i$ = log of industry assets and capital stock output ratio, obtained from calculations made by D. Allard for the OFT.

$UNION_i$ = % of workers covered by a collective agreement, from the New Earnings Survey. One or two missing observations were filled using Order averages.

All other variables used were derived from these or directly obtained from the Census of Production; all market shares have been adjusted for imports and exports.

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7.1

CHAPITRE 7

Commerce Intra-Branche

Performances des firmes et analyse des échanges commerciaux dans la Communauté européenne

Centre d'Etudes Prospectives et d'Informations Internationales
Paris

Contents

7.3

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PERFORMANCES DES FIRMES ET ANALYSE DES ECHANGES COMMERCIAUX DANS LA COMMUNAUTE EUROPEENNE

RAPPORT FINAL

Introduction

La libre circulation des marchandises dans le Grand marché communautaire devrait apporter globalement de grands bénéfices aux Etats membres. Le jeu combiné d'une meilleure allocation des ressources par une spécialisation accrue, d'économies d'échelle et d'une plus forte pression de la concurrence devrait conduire à des gains d'efficacité donnant un nouvel élan aux entreprises européennes et améliorant le bien-être dans la Communauté.

Il va de soi que ce processus ne saurait se réaliser qu'au prix de changements structurels au sein de la Communauté, qui seront plus ou moins accentués selon le pays, la région ou le secteur, et qui toucheront à la fois l'organisation de l'appareil productif et la structure des échanges commerciaux des pays membres.

Or un diagnostic sur les effets de la réalisation du Grand marché sur les structures de production et d'échange nécessite une analyse approfondie. Il faut en effet comprendre les différentes modalités d'insertion des économies des pays membres dans leur commerce extra et intra-communautaire, analyser les liens existant avec leurs structures productives, et mesurer les rôles respectifs de leurs conditions macro-économiques collectives et des caractéristiques micro-économiques de leurs entreprises dans la détermination de leurs performances extérieures.

L'objectif du présent travail est double. Sur le plan des mécanismes du commerce, il s'agit, à travers l'étude du cas français, de montrer l'existence de modalités diverses d'insertion dans les échanges commerciaux à l'intérieur de la Communauté et au niveau mondial. Nous chercherons à les identifier, à mesurer leur importance quantitative et à présenter la disparité des performances extérieures selon chacune d'entre elles.

Du côté de la production, l'analyse se centrera, à travers le cas de la France, sur les rapports qui s'établissent entre les performances individuelles des entreprises et la composition de l'échange au niveau national. Nous étudierons dans un premier temps les caractéristiques individuelles des entreprises, ainsi que leurs disparités sectorielles et leur dispersion à l'intérieur de chaque secteur. Nous tâcherons par la suite d'étudier l'articulation entre les caractéristiques spécifiques des entreprises et leurs types d'engagement à l'exportation.

Ce rapport contient donc deux parties. La première partie est consacrée à l'analyse de la composition des échanges commerciaux de l'économie française et de ses modalités d'insertion dans le commerce mondial et le commerce intra-communautaire. La deuxième partie porte sur l'analyse des caractéristiques individuelles des entreprises, et de leur liaison avec les performances et types d'engagement à l'exportation.

PREMIERE PARTIE :

ANALYSE DE LA COMPOSITION DES ECHANGES COMMERCIAUX DE LA FRANCE ET DE SES MODALITES D'INSERTION DANS LE COMMERCE MONDIAL ET DANS LE COMMERCE INTRA-COMMUNAUTAIRE

7.9

Les études dans le domaine du commerce extérieur disposent, depuis longtemps déjà, de tout un ensemble d'outils et d'instruments analytiques qui ont servi à étayer des systèmes et des modèles explicatifs bien connus. Mais les configurations observées des flux de commerce entre les pays industriels en général, et à l'intérieur de la Communauté en particulier, ne paraissent pas répondre, pour le moins uniquement, aux schémas explicatifs traditionnels. Certains phénomènes semblent en fait se situer en dehors de la problématique retenue dans ces schémas.

Les modèles qui découlent des analyses traditionnelles décrivent, on le sait, des échanges univoques entre pays. En raison des différences de dotations factorielles, d'aptitudes technologiques, d'habitudes de production et de consommation, certains pays se trouvent plus aptes à exercer tels ou tels types d'activités plutôt que tels ou tels autres. Des formes de spécialisation apparaissent selon des mécanismes d'avantages et de désavantages comparés. La composition de l'échange au niveau d'une économie nationale montre alors un ensemble de biens exportés et un ensemble de biens importés. Dans ce cadre, un produit est soit exporté, soit importé, soit non échangé.

Or, le commerce intra-européen est largement composé d'échanges intra-branche. C'est-à-dire que les principaux pays de la Communauté se trouvent, dans les nomenclatures usuelles, être à la fois exportateurs et importateurs des mêmes produits. La compréhension des ressorts du commerce intra-branche est dès lors une composante essentielle dans l'analyse des modalités du commerce. Elle l'est d'autant plus que les positions acquises dans ce type d'échanges ont quelques raisons d'être plus fragiles que les résultats obtenus dans le commerce univoque.

Cette partie est composée de la manière suivante : dans un premier temps nous introduirons le cadre d'analyse et définirons les différentes modalités du commerce ; dans un second temps nous analyserons de manière empirique l'insertion de l'économie française dans le commerce mondial et dans le commerce communautaire.

1.1. L'identification des différentes modalités du commerce

Sur le plan analytique, le commerce univoque, où certaines activités sont uniquement exportatrices tandis que d'autres sont uniquement importatrices, ne semble pas poser trop de problèmes. Conformément à la logique bien connue de la division du travail, les échanges univoques reflètent des situations d'avantages et de désavantages comparés clairement définies.

Le phénomène des échanges commerciaux dits intra-branche, en revanche, a été à l'origine d'une multiplicité d'approches, qui témoigne des difficultés rencontrées dans l'analyse de ce sujet.

Au premier plan apparait la difficulté à cerner le concept lui-même. C'est un problème de définition. Qu'entend-on par "commerce intra-branche" ?

Deux réponses, qui sont en même temps le point de départ de deux approches différentes, sont données pour cette première question.

a) La première approche retient une problématique de spécialisation intra-branche. A l'intérieur d'une même branche, les pays se spécialisent, chacun, dans la production, et l'exportation, de tels ou tels biens, en échange, à l'importation, de tels ou tels autres. Les produits exportés et importés, bien qu'appartenant à une même branche, présentent des différences significatives de leurs caractéristiques techniques et de leurs destinations d'usage. Les branches étant définies conventionnellement à partir d'un agrégat statistique comportant, chacun, un large ensemble de produits, la composition du commerce montre, compte tenu de l'existence des spécialisations intra-branche, des flux d'échanges qui s'effectuent à l'intérieur d'une même branche. C'est un commerce intra-branche qui reflète des phénomènes de spécialisation fine, suffisamment fine pour ne pas pouvoir être appréhendée par les nomenclatures statistiques de branches.

Pour cette approche, les ressorts du commerce intra-branche ne sont pas différents de ceux des modèles classiques de spécialisation, et sa manifestation tient à la désagrégation insuffisante ou inadaptée des nomenclatures.

b) La deuxième approche considère que le commerce intra-branche traduit des échanges croisés de produits similaires. Il se manifeste par la simultanéité d'exportations et d'importations d'un produit donné dans le commerce extérieur d'un pays avec l'un de ses partenaires ou à l'intérieur d'une zone.

C'est cette deuxième approche que nous approfondirons le plus dans la présente étude. C'est elle en effet qui pose le plus de questions à la théorie classique du commerce international. C'est donc elle qui est susceptible de conduire à des conclusions différentes, aux plans analytique et politique, de celles auxquels conduit cette théorie.

Dans la plupart des études dans ce domaine, le phénomène du commerce intra-branche est considéré a priori comme antagonique à l'égard du principe de la spécialisation internationale. La simultanéité d'exportations et d'importations de produits similaires est considérée a priori comme incompatible avec le fonctionnement des avantages comparés et avec les spécialisations qui s'en dégagent. Le débat sur ce point n'est pas seulement théorique, il porte aussi sur les conséquences économiques d'une telle modalité du commerce. Le développement des échanges croisés de produits similaires, surtout à la suite des mesures d'allègement des barrières douanières à l'intérieur d'une zone économique, est-il bénéfique pour les économies nationales concernées et pour la zone dans son ensemble, ou, au contraire, présente-il des inconvénients pour les appareils productifs nationaux et pour les équilibres commerciaux à l'intérieur de la zone considérée ?

En effet, les arguments avancés en faveur du libre-échange sont fondés sur les gains qui reviennent aux partenaires engagés dans le commerce international à la suite du fonctionement du principe des avantages comparatifs. L'existence de productivités comparatives différentes d'un pays à l'autre dans l'exercice de telle ou telle activité, la disparité quantitative de dotations factorielles entre les pays et l'emploi des facteurs en proportions différentes entre les branches, les aptitudes technologiques, les expériences et les habiletés acquises, etc. sont des éléments qui favorisent l'instauration d'une division internationale du travail. Celle-ci n'est pas donnée une fois pour toutes, mais à chaque moment elle conduit à une meilleure allocation des ressources productives et à des gains de productivité par des processus d'ajustement et de restructuration. Les importations représentent un gain d'opportunité parce qu'elles libèrent des capitaux et des hommes qui seront affectés dans les activités où le pays bénéficie d'avantages comparatifs.

Que reste-t-il des arguments en faveur du libre échange avec le développement des échanges croisés des produits similaires, si ce commerce est contraire à la spécialisation internationale et aux systèmes établis selon les avantages et désavantages comparés ? Si un pays est capable de produire et d'exporter, à des prix compétitifs, tel ou tel produit, et que le même produit figure en même temps dans la liste des produits importés, ne vaut-il pas mieux, surtout si cet échange est déficitaire, réduire les importations pour libérer des parts de marché pour des entreprises nationales capables de produire et même d'exporter à des prix compétitifs ? Pour répondre à ces questions, il faut analyser les fondements du commerce intra-branche, pour bien comprendre que la constatation de son existence ne supprime pas toute validité à la théorie des avantages comparatifs.

1.1.1. Qu'est-ce que le commerce intra-branche ?

Situer notre travail par rapport aux autres travaux dans ce domaine commence avec la définition du phénomène à traiter. Certains auteurs à l'instar de B. Balassa (1966, 1986), Grubel et Lloyd (1975), A. Aquino (1978), entre autres, s'intéressent à des échanges "intra-industriels" (intra-industry trade). Cette terminologie se réfère à la définition anglo-saxonne courante de l'industrie comme étant "un groupe de producteurs en concurrence pour la production d'un même ensemble de marchandises "(Grubel et Lloyd, 1975, p. 5). La démarche adoptée par ces auteurs retient donc comme problématique la simultanéité d'exportations et d'importations entre des groupes de producteurs semblables, plutôt que la simultanéité de l'échange de produits similaires. Ce sont donc les agents qui se trouvent au centre de cette démarche plutôt que le produit.

D'autres auteurs, B. Lassudrie-Duchêne et Mucchielli (1979), F. Claire, O. Gaussens et Duc-Loi Phan (1984), abordent la question du commerce intra-branche du côté du produit. C'est cette approche que nous privilégierons dans la présente étude. Le commerce intra-branche sera donc abordé dans notre démarche comme le phénomène selon lequel apparaissent au niveau d'une économie nationale donnée une simultanéité d'exportations et d'importations de produits similaires dans ses échanges avec l'un de ses partenaires ou à l'intérieur d'une zone.

Cette définition de notre approche doit être complétée par les trois considérations suivantes :

a) Situer l'analyse au niveau du produit n'implique nullement que la logique sectorielle soit niée. Les firmes en concurrence pour la production d'un même groupe de biens, malgré la diversité de leurs productions, de leurs stratégies et de leurs performances, obéissent toutes, à un moment donné, à des contraintes sectorielles collectives en matière de ressources humaines, de disponibilité des capitaux et de structures organisationnelles propres au secteur. Si nous disons "à un moment donné" c'est pour éviter, comme le souligne A. Jacquemin (1975), une vision statique selon des contraintes structurellement déterminées. "Outre les politiques adaptatives qui caractérisent généralement le court terme, une entreprise est capable d'agir sur l'évolution de son secteur industriel et de modifier, au fil du temps, ses conditions de demande et de coût" (p. 4).

b) Situer l'observation au niveau du produit nécessite que le produit soit identifié avec le maximum d'objectivité possible. Ceci doit être assuré par la prise en considération détaillée des caractéristiques techniques et qualitatives principales du produit. C'est la raison pour laquelle nous utilisons, dans un premier temps, et sans aucune agrégation, les statistiques de base de la Nimexe à son niveau le plus détaillé

(6 chiffres), qui contient pour l'ensemble de biens manufacturés six mille produits environ. Dans un second temps, nous considérons que si les statistiques de la Nimexe nous assurent une définition assez précise des spécificités techniques du produit, elles ne sont pas en mesure de laisser apparaitre l'existence d'éventuelles différences qualitatives qui peuvent exister entre deux produits ayant les mêmes spécifications techniques de base. C'est pourquoi, dans l'analyse des échanges croisés de produits similaires, le produit exporté et le produit importé ne seront considérés comme similaires que si, d'une part, ils correspondent tous deux à la même rubrique de la Nimexe à 6 chiffres (similarité des spécifications techniques) (1), et si, d'autre part, et afin d'assurer une similarité qualitative, leurs prix (en fait leurs valeurs unitaires) à l'exportation et à l'importation sont proches. La valeur unitaire constitue pour nous un indicateur de qualité. Il est supposé que deux valeurs unitaires comparables à l'exportation et à l'importation pour un produit donné indiquent que le produit exporté et le produit importé sont de qualités équivalentes.

c) Situer l'observation au niveau du produit, pour déceler des échanges croisés des produits similaires, conduit instantanément à s'interroger sur la nature des autres formes d'échanges. De manière simple, si le commerce au niveau d'un produit donné ne relève pas des échanges croisés des produits similaires, à quelles autres formes d'échanges peut-il correspondre ? Cette remarque posée avec beaucoup de simplification vise à attirer l'attention sur le fait que les échanges croisés de produits similaires ne peuvent pas être appréhendés dans l'absolu, mais doivent l'être de manière conjointe avec les autres formes d'échanges.

1.1.2. <u>Comment évaluer l'importance quantitative du commerce croisé</u> ?

Plusieurs auteurs considèrent que le commerce intra-branche est par définition équilibré. En d'autres termes, les échanges à étudier doivent être de grandeurs égales. L'importance relative du phénomène est donc évalué par l'ampleur des exportations et des importations qui, à l'intérieur de l'échange, sont équilibrées. Les excédents des unes par rapport aux autres sont considérés comme étant un échange inter (et non pas intra) branche. C'est en particulier le cas de l'approche de Grubel et Lloyd, qui s'exprime par la formule bien connue :

$$Bi = \frac{(Xi + Mi) - |Xi - Mi|}{(Xi + Mi)} \times 100$$

où Bi est l'indicateur de l'intensité du commerce intra-branche pour la branche i, et Xi et Mi les exportations et les importations correspondantes.

Cette approche nous parait indéfendable. Si le concept à étudier se réfère à l'existence d'échanges croisés de produits similaires, pourquoi se limite-t-on à des fractions de ce commerce ? A supposer qu'un échange croisé existe pour un produit donné et que cet échange est excédentaire, comment peut-on concevoir qu'une partie des exportations de ce produit est un commerce intra-branche et qu'une autre partie des exportations du même produit est inter-branches ? Il est plus naturel de considérer que le produit en question fait l'objet d'un échange croisé et que cet échange est excédentaire.

Les principes sur lesquels s'appuie notre méthode de mesure sont les suivants :

a) La similarité de produits implique que le produit exporté et le produit importé sont de même spécification technique et d'une qualité égale (même catégorie de gamme).

b) Les échanges croisés de produits similaires doivent être analysés en lien avec les autres formes d'échanges au niveau du produit.

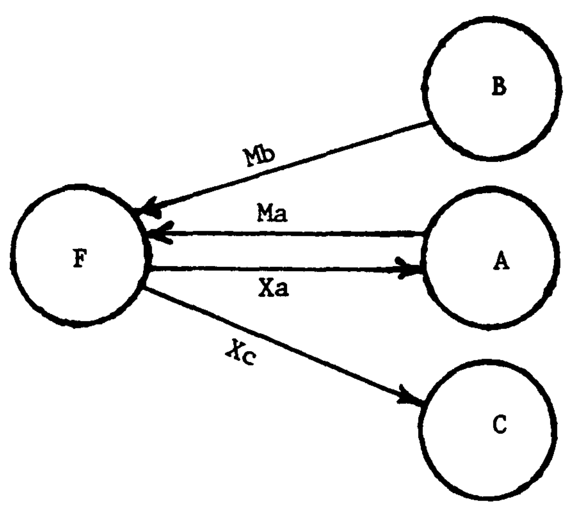
c) L'observation de la composition du commerce a montré qu'au niveau de chaque produit Nimexe à 6 chiffres les flux d'exportations et d'importations entre un pays et l'ensemble de ses partenaires commerciaux pris individuellement peuvent correspondre à l'une ou à l'autre des trois modalités ci-dessous :

i) des échanges univoques : c'est la forme dans laquelle la catégorie de gamme du produit, définie selon le niveau de sa valeur unitaire (2), est uniquement exportée ou uniquement importée.

ii) des échanges de gamme : dans cette modalité, une catégorie de gamme du produit figure uniquement à l'exportation ou à l'importation, tandis qu'une autre catégorie de gamme donne lieu à un flux en sens inverse.

iii) des échanges croisés de produits similaires : dans ce cas, la même catégorie de gamme du produit est à la fois exportée et importée (3). Les échanges croisés de produits similaires peuvent être bilatéraux si la simultanéité d'exportation et d'importation des produits similaires concerne le même partenaire, ou triangulaires si les partenaires sont différents.

En effet, il convient, à l'intérieur de l'observation globale du commerce croisé, de distinguer la part bilatérale et la part triangulaire, comme le montre le dessin illustratif suivant :



Dans l'observation globale du phénomène, l'on constate, pour la France (F), un total d'exportation (Xa + Xc) portant sur des produits pour lesquels existent en même temps des importations (Ma + Mb). Ce commerce représente, dans sa totalité, des échanges croisés de produits similaires pour la France. N'empêche que cette observation globale recouvre, d'une part, un commerce croisé bilatéral (Xa + Ma), et, d'autre part, un commerce croisé triangulaire (Xc + Mb).

d) Une fois identifiés au niveau de chaque produit Nimexe à 6 chiffres, les flux correspondant à chaque modalité sont agrégés à des niveaux intermédiaires de nomenclature. Ceci a pour but d'apprécier l'ampleur relative de chaque modalité au niveau de ces agrégats statistiques qui n'ont ici qu'une fonction de présentation. Le poids relatif de chaque modalité est parfaitement indépendant du niveau d'agrégation auquel les résultats sont présentés, car l'analyse est effectuée au niveau le plus fin. Contrairement à la démarche adoptée par Grubel et Lloyd, et d'autres auteurs, où le phénomène est évalué à des niveaux agrégés et où on cherche par la suite à vérifier si celui-ci persiste à des niveaux moins agrégés, nous partons, d'abord, d'un niveau d'analyse très détaillé pour ensuite agréger les résultats.

1.1.3. Comment situer le commerce croisé par rapport aux mécanismes traditionnels de spécialisation ?

Notre analyse des échanges croisés de produits similaires se fonde sur une problématique de compétitivité. Celle-ci est appréhendée à deux niveaux, macro-économique et micro-économique.

Le premier niveau est retenu dans les analyses traditionnelles en termes d'avantages et de désavantages comparatifs nationaux. L'attention est alors souvent portée sur des caractéristiques collectives de supériorité et d'infériorité relatives, saisies au niveau des branches d'activités. La disparité quantitative de dotations factorielles, les différences de niveaux technologiques, de modes de consommation, de niveaux de développement et d'industrialisation, sont, entre autres, des éléments macro-économiques qui expliquent que tel ou tel pays détient un avantage comparatif dans telle ou telle branche, et que tel ou tel autre pays bénéficie d'un avantage, ou d'un moindre désavantage, dans telle ou telle autre branche.

Même en relâchant les hypothèses simplificatrices de concurrence parfaite, dont l'infirmation justifie aux yeux de certains un rejet hâtif du corps analytique traditionnel, il existe entre pays des disparités des capacités d'offre en matières d'aptitudes technologiques, d'habitudes de production et de disponibilités en facteurs et en ressources naturelles qui, ajoutées aux disparités de demande selon les modes et les habitudes de consommation, font apparaître, à travers des constatations empiriques, des inégalités collectives de performance entre les pays selon les différentes branches.

Ainsi, même dans des systèmes de concurrence imparfaite, les avantages comparatifs nationaux existent. Ils sont collectifs, c'est-à-dire qu'ils caractérisent l'environnement économique général dans le cadre duquel les entreprises en concurrence pour la production à l'intérieur d'une même branche opèrent.

L'introduction des conditions de concurrence imparfaite sur les marchés des produits, des biens intermédiaires et des facteurs de production conduit à observer la compétitivité à un deuxième niveau qui est, lui, de nature micro-économique.

Contrairement aux systèmes de concurrence parfaite, où les avantages et désavantages comparatifs collectifs s'appliquent uniformément à l'ensemble des entreprises d'une branche donnée, ce qui conduit à ce que le produit de cette branche soit uniquement exporté (cas d'avantage comparatif généralisé) ou uniquement importé (cas de désavantage comparatif généralisé), les conditions de concurrence imparfaite offrent aux entreprises des éléments concurrentiels supplémentaires qui créent des effets de dispersion de performances entre les entreprises productrices d'un même bien.

Le concept selon lequel les firmes peuvent disposer, à leur niveau, d'un avantage compétitif spécifique n'est guère nouveau. Cette problématique se trouve déjà dans des travaux de J.S. Bain (1956), S. Hymer (1960), C. Kindleberger (1969), entre autres. Face à des contraintes collectives au niveau de la branche, les entreprises disposent, grâce aux éléments de concurrence imparfaite, d'une latitude de stratégies aboutissant à des résultats différents. De la phase de la conception du produit, en passant par les divers stades de sa fabrication jusqu'à la commercialisation finale, les entreprises adoptent des techniques différentes, elles ne s'approvisionnent ni avec les mêmes possibilités ni aux mêmes prix sur les marchés des ressources productives et de biens intermédiaires. Elles n'ont ni la même taille ni le même niveau de qualification de la main-d'oeuvre. Elles ne sont pas toutes situées au même niveau sur la courbe d'apprentissage. Et elles n'ont pas toutes le même niveau d'autofinancement ni les mêmes possiblités d'accès aux marchés financiers et de crédits.

L'ensemble de ces éléments concurrenciels micro-économiques supplémentaires, devant leur origine aux conditions de concurrence imparfaite, font qu'à un moment donné, et par rapport à une norme collective de compétitivité au niveau de la branche, certaines entreprises se trouvent dotées d'un avantage compétitif spécifique par rapport aux autres firmes en concurrence pour la production d'un même bien.

Ainsi, si nous reprenons les solutions finales des mécanismes d'avantages et des désavantages comparatifs qui, nous le savons tous depuis Gottfried Haberler, aboutissent à des spécialisations incomplètes, dans le sens où, en raison de coûts d'opportunité croissants, une production domestique existe, aussi, pour les produits à désavantages comparatifs, il est aisé de comprendre que même pour les produits normalement importés, certaines firmes domestiques sur-compétitives par rapport à la norme collective parviennent à concurrencer les firmes étrangères sur le marché domestique ou à l'exportation. Un tel échange croisé de produits similaires sera forcément déficitaire. Plus précisément il sera constitué de flux majoritaires d'importation en conformité avec la situation domestique collective de désavantage comparatif, d'une part, et de flux minoritaires inverses d'exportation reflétant des situations de surcompétitivité micro-économiques spécifiques au niveau de certaines firmes nationales. De façon symétrique, pour une production domestique caractérisée, à l'échelle nationale, par des conditions d'avantages comparatifs collectifs, les échanges croisés de produits similaires seront constitués de flux majoritaires d'exportation et de flux minoritaires d'importation. Si les premiers sont le reflet de la situation d'un avantage comparatif collectif national, les deuxièmes sont à mettre en correspondance avec des phénomènes de sur-compétitivité de firmes dans les pays partenaires.

Il ne faut pas avoir une vision statique des avantages et des désavantages comparatifs nationaux. Ces avantages et désavantages collectifs ne sont exogènes qu'à court et moyen termes. Les avantages compétitifs spécifiques de firmes peuvent, à plus ou moins long terme, être accessibles à l'ensemble des entreprises de la branche. Le spécifique peut devenir collectif, des avantages comparatifs peuvent se créer et d'autres peuvent disparaitre.

1.2. L'analyse empirique de l'insertion de la France dans le commerce international

L'analyse portera sur les années 1978 et 1984. Le choix des années a été guidé par la volonté, d'une part, d'étudier sur une période assez longue le caractère structurel des phénomènes considérés et d'observer leur évolution temporelle, d'autre part, d'éviter d'analyser des années trop atypiques.

Concernant les sources statistiques, c'est à l'aide des statistiques du commerce extérieur du Marché commun (Nimexe à 6 chiffres) que l'analyse des modalités d'insertion de l'économie française dans ses échanges commerciaux de biens manufacturés est effectuée.

L'analyse des modalités d'insertion de l'économie française dans ses échanges commerciaux extérieurs est organisée dans l'ordre suivant : d'abord un aperçu des modalités d'insertion de l'économie française dans son commerce manufacturier avec le monde ; ensuite une analyse spécifique du commerce manufacturier intra-communautaire de la France ; enfin un approfondissement de l'analyse du commerce croisé de produits similaires intra-européen de la France.

1.2.1. Un aperçu des modalités d'insertion de l'économie française dans le commerce mondial de biens manufacturés

L'analyse de la composition du commerce extérieur de la France en 1978 et en 1984 révèle l'importance des différentes modalités d'insertion de la France dans le commerce extérieur de biens manufacturés. Les tableaux 1.a et 1.b montrent le poids relatif de chacune des modalités précédemment définies : échanges univoques, échanges de gamme, échanges croisés bilatéraux et triangulaires de produits similaires, pour 1978 et 1984 respectivement.

L'observation des résultats présentés dans les tableaux 1.a et 1.b montre qu'en 1984 23 % des échanges extérieurs français de produits manufacturés au niveau mondial, correspondent à des échanges univoques. Le commerce, dans ce cas, porte sur des catégories de produits qui figurent uniquement dans la liste des exportations ou uniquement dans la liste des importations. Par rapport à l'année 1978, où le commerce univoque n'entrait que pour 18 % dans le total des échanges extérieurs français de produits manufacturés, la France montre, en 1984, une tendance vers plus d'engagement dans cette modalité du commerce.

Aussi bien en 1978 qu'en 1984, les exportations univoques de biens manufacturés de la France portent, dans leur plus grande partie, sur des catégories de produits haut de gamme, si l'on en juge par leurs prix à l'exportation. En 1984, 45,3 % des exportations univoques françaises portent sur des catégories de gamme ayant un prix (en fait une valeur unitaire) qui dépasse de plus de 15 % le prix moyen de ce produit dans le commerce total intra-CEE. Les exportations univoques portant sur des catégories de gamme moyennes (valeur unitaire $\simeq$ prix CEE $\pm$ 15 %) représentent 38 %. Celles qui portent sur des catégories de bas de gamme (valeur unitaire inférieure de plus de 15 % au prix CEE) ne représentent, en 1984, que 16,7 % des exportations univoques de la France. La comparaison avec la structure des exportations univoques de la France en 1978, où les catégories de produits haut de gamme, de gamme moyenne, et de bas de gamme, représentaient, respectivement, 38 %, 32 % et 30 %, illustre que l'engagement de l'économie française dans les exportations univoques en

Tableau 1.a : Poids relatifs des différentes modalités d'insertion dans le commerce mondial de produits manufacturés (France-monde, 1978)

Milliards F.F.

Modalités d'insertion		**Commerce total**	**%**		**Exportations**	**Importations**	**Taux de couverture**	
Echanges univoques		92	18		51	41	124	
Echanges de gamme		174	35		91	82	111	
Echanges croisés	bilatéraux	81	16	46	41	40	101	113
	triangulaires	152	30		83	69	120	
Total industriel		503	100		268	235	114	
Commerce résiduel		4						

Tableau 1.b : Poids relatifs des différentes modalités d'insertion dans le commerce mondial de produits manufacturés (France-monde, 1984)

Milliards F.F.

<table>
<tr><th colspan="2">Modalités d'insertion</th><th>Commerce total</th><th colspan="2">%</th><th>Exportations</th><th>Importations</th><th colspan="2">Taux de couverture</th></tr>
<tr><td colspan="2">Echanges univoques</td><td>271</td><td colspan="2">23</td><td>167</td><td>104</td><td colspan="2">161</td></tr>
<tr><td colspan="2">Echanges de gamme</td><td>357</td><td colspan="2">30</td><td>176</td><td>182</td><td colspan="2">97</td></tr>
<tr><td rowspan="2">Echanges croisés</td><td>bilatéraux</td><td>175</td><td>15</td><td rowspan="2">46</td><td>82</td><td>93</td><td>88</td><td rowspan="2">96</td></tr>
<tr><td>triangulaires</td><td>359</td><td>31</td><td>179</td><td>180</td><td>100</td></tr>
<tr><td colspan="2">**Total industriel**</td><td>1.173</td><td colspan="2">100</td><td>607</td><td>566</td><td colspan="2">107</td></tr>
<tr><td colspan="2">**Commerce résiduel**</td><td>11</td><td colspan="2"></td><td></td><td></td><td colspan="2"></td></tr>
</table>

1984 par rapport à 1978, porte davantage sur les catégories de produits haut de gamme.

Les importations univoques de la France sont réparties, en 1984, pour 46,5 % (43 % en 1978) en catégories de gamme moyenne, pour 29 % (27 % en 1978) et pour 25 % (30 % en 1978) en catégories de haut et de bas de gamme respectivement.

Les structures observées, en 1978 et 1984, des échanges univoques français montrent donc une spécialisation assez marquée dans les catégories de produit haut de gamme.

Les regroupements par secteur révèlent une forte intensité d'échanges univoques dans le commerce extérieur des biens des mines et des carrières, ainsi que dans le commerce des matériels de transport lourds (construction navale, aéronautique et matériel ferroviaire roulant). Très faibles sont les échanges univoques dans le commerce français de biens d'équipement professionnels, de biens de consommation courante, de biens intermédiaires industriels et dans le secteur automobile.

L'analyse par partenaire montre que la France est le plus engagée dans des échanges univoques avec les pays de l'OPEP, les pays en voie de développement hors OPEP et les NPI d'Amérique latine.

Une autre modalité d'insertion dans les échanges extérieurs est représentée par les échanges de gamme. Au niveau du produit (Nimexe à 6 chiffres) certaines catégories de gamme, identifiées par leurs valeurs unitaires, sont uniquement exportées, en échange à l'importation d'autres catégories de gamme du même produit, uniquement importées.

Les échanges extérieurs de la France correspondant à cette modalité représentent, comme le montrent les tableaux 1.a et 1.b, 30 % en 1984 (35 % en 1978) du total du commerce extérieur de la France dans le champ des biens manufacturés. Encore une fois, la France montre, dans cette modalité d'insertion, une spécialisation à l'exportation dans les catégories de haut de gamme. Son taux de couverture dans cette catégorie

(134 en 1984 et 128 en 1978) est largement supérieur à celui correspondant à son commerce dans la catégorie de gamme moyenne (75 en 1984 et 116 en 1978), et nettement plus élevé que le taux de couverture réalisé dans le commerce des catégories de bas de gamme (64 en 1984 et 84 en 1978).

Les échanges de gamme sont relativement importants dans le commerce extérieur français des biens de consommation courante (43 % en 1984 et 40 % en 1978) et des biens d'équipement professionnels (40 % en 1984 et 38 % en 1978). Leur part est très faible dans le secteur automobile, surtout en 1984 où elle ne représentait que 11 % du total du commerce dans ce secteur (26 % en 1978).

Quant aux échanges croisés de produits similaires, l'étude montre que la France a effectué en 1984 des flux simultanés d'exportations et d'importations de produits ayant les mêmes spécificités techniques de base (même rubrique Nimexe à 6 chiffres) et des qualités comparables à l'exportation et à l'importation (écart de prix inférieur à 15 %), d'un montant total de 534 milliards de francs. Ceci représente 45,5 % du total du commerce français de biens manufacturés. La part que représentent les échanges croisés dans le total du commerce français dans le champ industriel en 1984 est sans changement par rapport à 1978.

Il est à noter qu'en 1984, tout comme en 1978, le commerce croisé français de produits similaires est, au niveau mondial, essentiellement triangulaire. Pour un tiers seulement, ce commerce est bilatéral (les partenaires à l'exportation et à l'importation sont les mêmes). Pour deux tiers, il est triangulaire (les partenaires à l'exportation et à l'importation sont différents).

Dans sa totalité, le commerce croisé de produits similaires (bilatéral et triangulaire) semble plutôt concerner les catégories de gamme moyenne. 54 % de ce commerce en 1984 (57 % en 1978) portent sur des produits appartenant à cette catégorie. La part des produits haut et bas de gamme dans le total du commerce croisé représente 34 % et 12 % en 1984, et 29 % et 14 % en 1978 respectivement.

L'étude par secteur montre une forte intensité du commerce croisé dans le secteur automobile et dans le secteur des biens intermédiaires industriels. Très faibles sont les échanges croisés effectués dans le commerce des biens intermédiaires des mines et des carrières, et dans le commerce des matériels de transport lourds.

L'étude par partenaire montre que le commerce croisé bilatéral est principalement effectué avec la Belgique-Luxembourg et avec la RFA. Le groupe de partenaires à l'importation dans les échanges croisés triangulaires comporte principalement la Belgique-Luxembourg, la RFA et l'Italie. Le groupe de partenaires à l'exportation intègre principalement les pays de l'OPEP et les PVD hors OPEP.

1.2.2. <u>L'analyse du commerce manufacturé intra-communautaire de la France</u>

L'application du même type d'analyse au commerce intra-communautaire de la France dans le champ de biens industriels a donné les résultats présentés dans le tableau 2.a pour l'année 1978 et le tableau 2.b pour l'année 1984. La Communauté est prise telle qu'elle était aux dates choisies, c'est-à-dire à neuf en 1978 et à dix en 1984.

La comparaison entre les tableaux 1 et 2 fait apparaître d'importantes différences de modalités d'insertion et de performances extérieures entre l'engagement de l'économie française dans son commerce intra-communautaire et son engagement dans le commerce mondial (4).

Concernant les modalités d'insertion, il est aisé de constater la part relativement faible des échanges univoques dans le commerce avec les partenaires européens (17 % en 1984), comparée au poids de cette modalité d'insertion (23 %) dans le commerce français avec l'ensemble du monde en cette même année. En 1978, la part des échanges univoques dans le commerce extérieur de la France était pratiquement égale dans ses échanges intra-CEE et dans son commerce mondial (18 %). L'évolution entre 1978 et 1984 montre donc que l'augmentation du poids relatif des échanges univoques français s'est réalisée en dehors de la zone européenne.

Cette faiblesse des échanges univoques est à l'avantage des échanges de gamme, dont le poids relatif (35 % en 1984) est supérieur à

Tableau 2.a : <u>Le poids relatifs des différentes modalités d'insertion dans les échanges intra-communautaires de produits manufacturés</u> (France-CEE, 1978)

Milliards F.F.

<table>
<tr><th colspan="2">Modalités d'insertion</th><th>Commerce total</th><th colspan="2">%</th><th>Exportations</th><th>Importations</th><th colspan="2">Taux de couverture</th></tr>
<tr><td colspan="2">Echanges univoques</td><td>52</td><td colspan="2">18</td><td>17</td><td>35</td><td colspan="2">49</td></tr>
<tr><td colspan="2">Echanges de gamme</td><td>92</td><td colspan="2">32</td><td>41</td><td>51</td><td colspan="2">80</td></tr>
<tr><td rowspan="2">Echanges croisés</td><td>bilatéraux</td><td>73</td><td>25</td><td rowspan="2">49</td><td>37</td><td>36</td><td>103</td><td rowspan="2">104</td></tr>
<tr><td>triangulaires</td><td>68</td><td>24</td><td>35</td><td>33</td><td>106</td></tr>
<tr><td colspan="2">Total industriel</td><td>287</td><td colspan="2">100</td><td>131</td><td>156</td><td colspan="2">84</td></tr>
<tr><td colspan="2">Commerce résiduel</td><td>2</td><td colspan="2"></td><td></td><td></td><td colspan="2"></td></tr>
</table>

Tableau 2.b : Le poids relatif des différentes modalités d'insertion dans les échanges intra-communautaires de produits manufacturés (France-CEE, 1984)

Milliards F.F.

Modalités d'insertion		**Commerce total**	**%**		**Exportations**	**Importations**	**Taux de couverture**	
Echanges univoques		108	17		28	80	35	
Echanges de gamme		221	35		103	118	88	
Echanges croisés	bilatéraux	148	23	48	70	78	90	87
	triangulaires	155	24		71	84	84	
Total industriel		637	100		276	362	76	
Commerce résiduel		5						

son importance relative dans le commerce France-monde en cette même année (30 %). Ceci représente une évolution par rapport à l'année 1978 où la part du commerce de gamme était plus faible dans les échanges France-CEE (32 %) que dans les échanges France-monde (35 %).

Si, dans sa totalité, le commerce croisé de produits similaires effectué par la France représente un poids comparable dans ses échanges intra-communautaire et au niveau mondial (49 % et 46 % en 1978, et 48 % et 46 % en 1984 respectivement), la composition de ce commerce en bilatéral et en triangulaire diffère significativement entre les deux. Dans le commerce France-CEE, l'importance relative des échanges croisés bilatéraux (25 % en 1978 et 23 % en 1984) est largement plus élevée que dans le commerce français tous partenaires confondus (16 % en 1978 et 15 % en 1984).

L'insertion de l'économie française par un commerce croisé triangulaire est visiblement moins importante dans les échanges communautaires (24 % en 1978 et en 1984) que dans le commerce total de la France (30 % en 1978 et 31 % en 1984).

Toujours dans le domaine des échanges croisés de produits similaires, il faut remarquer que le total mondial du commerce croisé bilatéral de la France (81 milliards F.F. en 1978 et 175 milliards en 1984) est pratiquement concentré dans ses échanges avec ses partenaires communautaires (73 milliards F.F. en 1978 et 148 milliards en 1984). <u>Environ 90 % en 1978 et 85 % en 1984 des échanges croisés bilatéraux de la France sont réalisés avec d'autres pays de la Communauté européenne</u>.

Les différences ne sont pas moindres sur la performance extérieure dans chaque modalité.

Le taux de couverture élevé que la France réalise dans ses échanges univoques à l'échelle mondiale ne se retrouve pas dans son commerce intra-CEE. Le commerce de gamme réussit moins à la France dans ses échanges intra-CEE. Il en est de même pour le commerce croisé triangulaire.

C'est au contraire dans son commerce croisé bilatéral de produits similaires à l'intérieur de la CEE que la France semble montrer le plus de compétitivité.

1.2.3. Les échanges croisés de produits similaires de la France à l'intérieur de la CEE

En 1984, le commerce croisé de produits similaires entre la France et les autres pays membres de la CEE, dans le champ des biens manufacturés, a atteint un montant total de 303,4 milliards de francs (141,2 milliards en 1978) soit 47,6 % (49,1 % en 1978) d'un total d'échanges de biens manufacturés de 637,5 milliards (287,4 en 1978).

Dans l'ensemble, en 1984, le commerce croisé de produits similaires dans les échanges français intra-CEE de biens manufacturés concerne principalement des produits de gamme moyenne. 63,6 % (66,9 % en 1978) de ce commerce portent sur des produits ayant une valeur unitaire proche de la moyenne européenne pour chaque produit Nimexe à 6 chiffres. Le commerce croisé de produits similaires dont la valeur unitaire est supérieure à la moyenne CEE plus 15 % (catégories de produit haut de gamme) représente 24,7 % (22,1 % en 1978). Quant au commerce croisé de produits de bas de gamme (valeur unitaire inférieure à la moyenne européenne moins 15 %), il ne représente que 11,7 % (11 % en 1978) du total des échanges croisés de produits similaires.

La comparaison entre les taux de couverture réalisés par la France dans son commerce croisé intra-CEE de produits haut de gamme, de gamme moyenne et de bas de gamme, laisse apparaître une compétitivité supérieure dans la première catégorie. Le taux de couverture dans le commerce croisé haut de gamme s'élève en 1984 à 94,4. Cette compétitivité est sensiblement inférieure dans le commerce croisé de produits similaires de gamme moyenne (taux de couverture égal à 87,4), elle est encore plus faible dans le commerce croisé de produits bas de gamme avec un taux de couverture égal à 69,5.

Les échanges croisés de produits similaires de la France dans son commerce intra-CEE de biens manufacturés montrent une intensité variable d'un secteur d'activités à l'autre. Les tableaux 3.a et 3.b illustrent ce constat pour les deux années 1978 et 1984. Il y apparait l'intensité particulièrement élevée du phénomène dans le secteur automobile : 69,1 % en 1984 (73,7 % en 1978) du commerce français intra-CEE dans ce secteur sont constitués de flux simultanés d'exportations et d'importations de produits similaires. Le deuxième secteur, après l'automobile, dont les échanges français intra-CEE sont caractérisés par une intensité élevée du commerce croisé, est le secteur des biens intermédiaires industriels. 52,2 % en 1984 (49,9 % en 1978) du commerce français intra-CEE dans ce secteur sont des échanges croisés de produits similaires. Le commerce croisé, en 1984 et en 1978, est faible dans le secteur des biens intermédiaires des mines et des carrières.

En ce qui concerne la décomposition des échanges croisés de produits similaires en commerce bilatéral et en commerce triangulaire, nous constatons qu'en 1984, le volume total du commerce croisé effectué par la Fance dans ses échanges de biens manufacturés avec ses partenaires de la CEE (303,4 milliards F.F.) se répartissait pour 148,3 milliards en échanges bilatéraux (48,9 %) et pour 155,1 milliards en échanges triangulaires (51,1 %) en provenance et à destination de partenaires différents. En 1978 cette répartition s'effectuait pour 51,5 % et pour 48,5 % en bilatéral et en triangulaire respectivement.

Si nous descendons au niveau des secteurs, comme le montrent les tableaux 4.a et 4.b pour 1978 et 1984 respectivement, on constate que l'on ne peut pas vraiment parler de disparité d'importance relative du bilatéral et du triangulaire d'un secteur à l'autre. Aussi bien en 1978 qu'en 1984, exception faite des deux secteurs des biens intermédiaires des mines et des carrières et des matériels de transport lourds pour lesquels le commerce croisé est d'ailleurs faible, la répartition entre le bilatéral et le triangulaire est assez stable autour de 50 % chacun dans l'ensemble des secteurs.

Le peu de disparité entre les secteurs de la répartition des échanges croisés de produits similaires entre le bilatéral et le triangulaire donne tout son poids au partenaire de l'échange en tant que facteur explicatif. En d'autres termes, si le type d'activités économiques ne

Tableau 3.a : Intensités par secteur du commerce croisé de produits similaires dans les échanges français intra-CEE de biens manufacturés (1978)

Millions F.F.

Niveau	Secteurs	Echanges croisés de produits similaires		T.C.	Total	Indice
		Exportations	Importations			
104 A	Biens intermédiaires des mines et des carrières	166	187	89	353	14,4
104 B	Biens intermédiaires industriels	23.462	28.863	81	52.325	49,9
105 A	Biens d'équipement professionnels	11.530	14.930	77	26.460	43,0
105 B	Biens d'équipement ménagers	1.022	1.641	62	2.663	35.8
105 C	Auto, moto, cycles	24.883	11.549	215	36.433	73,7
105 D	Matériel de transport lourd (naval, aéronautique, ferroviaire)	158	208	76	366	8,0
106	Biens de consommation courante	11.006	11.574	95	22.580	39,5
	Total industriel	72.227	68.952	105	141.179	49,1

Tableau 3.b : Intensités par secteur du commerce croisé de produits similaires dans les échanges français intra-CEE de biens manufacturés (1984)

Millions F.F.

Niveau	Secteurs	Echanges croisés de produits similaires		T.C.	Total	Indice
		Exportations	Importations			
104 A	Biens intermédiaires des mines et des carrières	534	415	128	949	19,8
104 B	Biens intermédiaires industriels	63.078	64.580	98	127.658	52,2
105 A	Biens d'équipement professionnels	25.749	33.650	77	59.399	40,8
105 B	Biens d'équipement ménagers	1.708	2.487	69	4.195	28,3
105 C	Auto, moto, cycles	28.706	32.143	89	60.848	69,1
105 D	Matériel de transport lourd (naval, aéronautique, ferroviaire)	540	3.277	16	3.817	37,4
106	Biens de consommation courante	20.612	25.889	80	46.501	36,0
	Total industriel	140.926	162.441	87	303.368	47,6

Tableau 4.a : La répartition du commerce croisé de produits similaires entre le bilatéral et le triangulaire par secteur (1978)

Milliards F.F.

	Biens intermédiaires de mines et de carrières					Biens intermédiaires industriels				
	Total	%	Exp.	Imp.	T.C.	Total	%	Exp.	Imp.	T.C.
Bilatéral	0,1	24	0,1	0,0	134	28,3	54	13,4	15,0	89
Triangulaire	0,3	76	0,1	0,2	78	24,0	46	10,1	13,9	73
Total	0,4	100	0,2	0,2	89	52,3	100	23,5	28,9	81

	Biens d'équipement professionnels					Biens d'équipement ménagers				
	Total	%	Exp.	Imp.	T.C.	Total	%	Exp.	Imp.	T.C.
Bilatéral	11,6	44	5,2	6,5	80	1,3	50	0,6	0,8	74
Triangulaire	14,8	56	6,4	8,5	75	1,3	50	0,5	0,9	52
Total	26,5	100	11,5	14,9	77	2,7	100	1,0	1,6	62

	Auto, moto, cycle					Matériel de transport lourd				
	Total	%	Exp.	Imp.	T.C.	Total	%	Exp.	Imp.	T.C.
Bilatéral	22,0	60	13,0	9,0	144	0,2	65	0,1	0,1	69
Triangulaire	14,4	40	11,9	2,5	473	0,1	35	0,1	0,1	90
Total	36,4	100	24,9	11,5	215	0,4	100	0,2	0,2	76

	Biens de consommation courante					Total industriel				
	Total	%	Exp.	Imp.	T.C.	Total	%	Exp.	Imp.	T.C.
Bilatéral	9,1	40	4,5	4,6	98	72,7	52	36,8	36,0	102
Triangulaire	13,5	60	6,5	7,0	93	68,4	48	35,5	33,0	108
Total	22,6	100	11,0	11,6	95	141,2	100	72,2	69,0	105

Tableau 4.b : La répartition du commerce croisé de produits similaires entre le bilatéral et le triangulaire par secteur (1984)

Milliards F.F.

	Biens intermédiaires de mines et de carrières					Biens intermédiaires industriels				
	Total	%	Exp.	Imp.	T.C.	Total	%	Exp.	Imp.	T.C.
Bilatéral	0,1	10	0,1	0,0	183	72,9	57	36,8	36,1	102
Triangulaire	0,9	90	0,5	0,4	124	54,7	43	26,3	28,5	92
Total	0,9	100	0,5	0,4	128	127,7	100	63,1	64,6	98

	Biens d'équipement professionnels					Biens d'équipement ménagers				
	Total	%	Exp.	Imp.	T.C.	Total	%	Exp.	Imp.	T.C.
Bilatéral	24,3	41	11,0	13,3	83	1,7	40	0,7	1,1	63
Triangulaire	35,1	59	14,7	20,4	72	2,5	60	1,0	1,4	73
Total	59,4	100	25,7	33,7	77	4,2	100	1,7	2,5	69

	Auto, moto, cycle					Matériel de transport lourd				
	Total	%	Exp.	Imp.	T.C.	Total	%	Exp.	Imp.	T.C.
Bilatéral	28,8	47	12,8	16,0	80	0,1	3	0,0	0,1	89
Triangulaire	32,1	53	15,9	16,1	99	3,7	97	0,5	3,2	15
Total	60,8	100	28,7	32,1	89	3,8	100	0,5	3,3	16

	Biens de consommation courante					Total industriel				
	Total	%	Exp.	Imp.	T.C.	Total	%	Exp.	Imp.	T.C.
Bilatéral	20,3	44	8,7	11,6	75	148,3	49	70,1	78,2	90
Triangulaire	26,2	56	11,9	14,3	84	155,1	51	70,9	84,2	84
Total	46,5	100	20,6	25,9	80	303,4	100	140,9	162,4	87

parait pas jouer un rôle discriminant dans la répartition du commerce croisé entre la partie bilatérale et la partie triangulaire, nous devrions nous attendre à ce que cette répartition soit un phénomène relié au partenaire de l'échange plutôt qu'au produit échangé.

Donc, l'identification des partenaires dans le commerce croisé bilatéral, d'une part, et des partenaires origine des importations et destinataire des exportations dans les échanges croisés triangulaires, d'autre part, prend ici une importance toute particulière.

Les tableaux 5.a et 5.b présentent, pour 1978 et 1984 respectivement, l'intensité du commerce croisé bilatéral entre la France et chacun de ses partenaires européens. Ce tableau contient :

1. Le volume total du commerce français de produits manufacturés avec chaque partenaire (colonne n° 1).

2. La part du partenaire dans le commerce français intra-CEE de produits manufacturés (colonne n° 2).

3. Le volume du commerce croisé bilatéral effectué avec le partenaire (colonne n° 3).

4. La part du partenaire dans le commerce croisé bilatéral intra-CEE de la France (colonne n° 4).

5. L'importance relative du commerce croisé bilatéral avec le partenaire dans le total du commerce avec le même partenaire (colonne n° 5).

6. Le taux de couverture dans le commerce manufacturier avec le partenaire (colonne n° 6).

7. Le taux de couverture dans le commerce croisé bilatéral avec le partenaire (colonne n° 7).

Tableau 5.a : Intensités relatives du commerce croisé bilatéral selon le partenaire (1978)

Milliards F.F.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Partenaire	**Commerce* total**	**%**	**Commerce* croisé bilatéral**	**%**	**(3)/(1) %**	**T.C. (Total industriel)**	**T.C. (commerce croisé bilatéral)**	**Indice (4)/(2)**
Belgique-Luxembourg	56,8	19,8	14,6	20,1	26	86	87	1,02
Pays-Bas	26,3	9,1	3,4	4,7	13	100	80	0,51
RFA	108,7	37,8	33,6	46,2	31	74	101	1,22
Italie	55,6	19,4	13,8	19,0	25	74	144	0,98
Royaume-Uni	34,6	12,0	7,1	9,7	20	121	86	0,81
Irlande	1,9	0,7	0,1	0,1	3	104	43	0,11
Danemark	3,5	1,2	0,1	0,2	4	148	84	0,16
CEE à neuf	287,4	100	72,7	100	25,3	84	102	1

*** Produits manufacturés**

Tableau 5.b : Intensités relatives du commerce croisé bilatéral selon le partenaire (1984)

Milliards F.F.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Partenaire	Commerce* total	%	Commerce* croisé bilatéral	%	(3)/(1) %	T.C. (Total industriel)	T.C. (commerce croisé bilatéral)	Indice (4)/(2)
Belgique-Luxembourg	116,0	18,2	34,3	23,2	30	70	62	1,27
Pays-Bas	57,3	9,0	10,4	7,0	18	75	121	0,78
RFA	226,0	35,5	68,5	46,2	30	65	92	1,30
Italie	131,1	20,6	20,2	13,6	15	68	109	0,66
Royaume-Uni	84,5	13,3	14,1	9,5	17	139	115	0,72
Irlande	7,7	1,2	0,1	0,1	1	44	43	0,08
Danemark	8,3	1,3	0,4	0,3	5	131	64	0,22
Grèce	6,7	1,0	0,1	0,1	1	290	96	0,08
CEE à dix	637,5	100	148,3	100	23,3	76	90	1

* Produits manufacturés

8. La colonne n° 8 montre un indice d'intensité relative des échanges croisés bilatéraux de produits similaires avec chaque partenaire. Il s'agit de la colonne n° 4 divisée par colonne n° 2. Un indice d'une valeur supérieure à 1 indique que la part du partenaire dans le commerce croisé bilatéral de la France est supérieure à sa part dans le total du commerce français toutes modalités confondues.

Avec un indice d'intensité relative d'échanges croisés bilatéraux de produits similaires égal à 1,22 en 1978 et à 1,30 en 1984, la RFA vient en tête comme étant le premier partenaire avec lequel la France est engagée dans cette modalité de commerce. En 1984, 30 % des échanges commerciaux de biens manufacturés avec l'Allemagne (31 % en 1978) sont constitués de flux simultanés d'exportations et d'importations de produits similaires. A lui seul, le commerce croisé bilatéral avec l'Allemagne représente, en 1984, 46,2 % (même proportion en 1978) du total des échanges croisés bilatéraux effectués par la France dans son commerce intra-CEE de biens manufacturés. Aussi bien en 1978 qu'en 1984, le taux de couverture dans le commerce croisé bilatéral avec la RFA est largement supérieur au taux de couverture industriel (toutes modalités confondues) avec ce partenaire.

Toute proche de l'Allemagne, la Belgique-Luxembourg apparait, en 1984, comme le deuxième partenaire en importance dans les échanges croisés bilatéraux de la France. Son indice d'intensité relative dans cette modalité est égal à 1,27, ce qui représente une évolution par rapport à la valeur de cet indice observée en 1978 légèrement supérieure à 1 (1,02). Les flux correspondant à ce type du commerce représentent 30 % en 1984 (26 % en 1978) du total des échanges commerciaux de biens industriels avec la Belgique.

Mais contrairement au cas de la RFA, l'évolution du commerce croisé bilatéral avec la Belgique montre, en 1984, des échanges très déficitaires. Le taux de couverture correspondant (62) est inférieur à celui réalisé dans le commerce total avec la Belgique (70).

C'est avec l'Irlande et le Danemark en 1978, l'Irlande, le Danemark et la Grèce en 1984, que la France est, de loin, le moins engagée dans des échanges croisés bilatéraux de produits similaires.

L'identité, dans les échanges croisés triangulaires, des partenaires origines des importations et des partenaires destinataires des exportations, est présentée dans les tableaux 6.a et 6.b pour les années 1978 et 1984 respectivement. Ces tableaux montrent la répartition des flux d'exportations et d'importations des échanges croisés triangulaires effectués par la France à l'intérieur de la Communauté européenne.

Bien évidemment, dans l'observation produit par produit des échanges croisés triangulaires, un partenaire donné se trouvera uniquement en tant qu'origine d'importations ou uniquement en tant que destinataire d'exportations. Mais, après agrégation, on obtient, pour chaque partenaire, une part à l'exportation et une part à l'importation dans les échanges croisés triangulaires de la France, tout simplement parce que le même partenaire peut figurer en tant qu'origine d'importation pour certains produits, et destinataire à l'exportation pour d'autres.

C'est en fait la comparaison entre les deux parts (colonne n° 5) qui peut faire apparaître la situation exacte de chaque partenaire, soit en étant majoritairement origine d'importations ou majoritairement destinataire d'exportations, dans les échanges croisés triangulaires de produits similaires effectués par la France.

Avec l'observation des résultats obtenus pour les deux années 1978 et 1984, il semble en fait aisé de constater l'existence de deux groupes distincts de partenaires de la France dans son commerce croisé triangulaire. Un premier groupe est constitué, en 1984, par la RFA, la Belgique-Luxembourg et les Pays-Bas, qui apparaissent plutôt (colonne n° 5) comme les origines des importations. La Belgique et la RFA faisaient aussi partie du même groupe en 1978. Un deuxième groupe composé par le Royaume-Uni, l'Irlande, le Danemark et la Grèce entre dans le commerce croisé triangulaire de la France en tant que destinataire des exportations. Le Royaume-Uni, l'Irlande et le Danemark faisaient également partie du même groupe en 1978. La Grèce ne comptait pas parmi les membres

Tableau 6.a : La répartition des flux d'exportations et d'importations des échanges croisés triangulaires de la France à l'intérieur de la CEE (1978)

Milliards F.F.

	(1)	(2)	(3)	(4)	(5)
Partenaire	Exportations	%	Importations	%	(4)/(2)
Belgique-Luxembourg	8,0	22,4	8,3	25,0	1,2
Pays-Bas	5,4	15,3	2,9	8,7	0,57
RFA	8,5	23,8	9,8	29,6	1,24
Italie	6,1	17,0	7,8	23,7	1,39
Royaume-Uni	6,4	18,0	3,7	11,2	0,62
Irlande	0,4	1,1	0,2	0,5	0,50
Danemark	0,8	2,4	0,4	1,3	0,53
Total CEE à neuf	35,5	100	33,0	100	1

Tableau 6.b : La répartition des flux d'exportations et d'importations des échanges croisés triangulaires de la France à l'intérieur de la CEE (1984)

Milliards F.F.

	(1)	(2)	(3)	(4)	(5)
Partenaire	Exportations	%	Importations	%	(4)/(2)
Belgique-Luxembourg	10,2	14,3	14,3	17	1,20
Pays-Bas	5,4	7,7	8,7	10,4	1,35
RFA	16,5	23,2	33,4	39,7	1,71
Italie	15,6	22,0	18,1	21,4	0,97
Royaume-Uni	18,1	25,3	7,0	8,3	0,33
Irlande	1,1	1,7	1,1	1,3	0,76
Danemark	2,1	3,0	0,9	1,1	0,37
Grèce	2,0	2,8	0,8	0,9	0,32
Total CEE à dix	70,9	100	84,2	100	1

de la CEE. L'évolution entre 1978 et 1984 se traduit par le passage des Pays-Bas d'un partenaire destinataire à l'exportation en 1978 à un partenaire origine d'importation en 1984 et par le fait que l'Italie, partenaire origine d'importations en 1978, semble, en 1984, se situer au même niveau que la France. Sa part dans les importations est pratiquement égale à sa part dans les exportations dans les échanges croisés triangulaires de produits similaires de la France.

DEUXIEME PARTIE :

ANALYSE DES LIENS ENTRE LES CARACTERISTIQUES INDIVIDUELLES DES ENTREPRISES ET LES MODALITES D'INSERTION DE LA FRANCE DANS LE COMMERCE INTERNATIONAL

L'examen de la composition du commerce et des diverses modalités d'engagement effectué dans la première partie visait à fournir les éléments descriptifs nécessaires et préalables à des développements analytiques plus approfondis.

Nous savons, à ce stade, qu'au niveau de l'économie nationale, l'insertion dans les échanges commerciaux extérieurs prend des modalités variées, et que la performance extérieure varie également d'une modalité du commerce à l'autre. Ceci conduit à s'interroger sur les déterminants des types d'engagement à l'exportation au niveau de l'unité exportatrice elle-même, c'est-à-dire au niveau de l'entreprise.

Il est certain que les performances d'une entreprise ne sont pas indépendantes de son lieu d'implantation, ce qui signifie que l'environnement économique collectif, identifié par des conditions générales d'offre, de demande et de concurrence, dans le cadre duquel l'entreprise exerce ses activités, joue un rôle dans la détermination de ces performances. D'un autre côté, l'entreprise elle-même, par ses choix stratégiques et ses décisions de gestion au cours de la conception, la fabrication et la commercialisation de ses produits, influe directement sur le niveau de sa performance.

Notre objectif, dans cette partie, consiste à éclairer le rôle joué par la dispersion des caractéristiques individuelles des entreprises, face aux conditions collectives de supériorité ou d'infériorité nationale, saisies au niveau des secteurs, dans l'explication des modalités d'engagement dans le commerce extérieur. Cette partie est organisée en trois sous-parties de la manière suivante.

A titre préliminaire, nous rappelons l'influence primordiale de l'appartenance sectorielle dans l'explication de la performance extérieure dans chaque mondalité du commerce considérée séparément. Nous souhaitons à ce stade vérifier que les effets des conditions collectives de performance, qui caractérisent l'environnement économique sectoriel, sont bien effectifs dans chaque modalité de commerce.

Vient ensuite l'étude des caractéristiques individuelles des entreprises et des rapports qui les lient avec le type d'engagement à l'exportation au niveau de l'entreprise. Les caractéristiques retenues dans le cadre de la présente étude sont la productivité, le taux de marge et la taille. L'analyse porte, dans un premier temps, sur les relations d'interdépendance entre les caractéristiques étudiées des entreprises. Dans un second temps, nous essayerons de distinguer les entreprises exportatrices sur le marché communautaire des entreprises non exportatrices sur ce marché, nous vérifierons l'existence de différences entre ces deux groupes d'entreprises en termes des trois variables retenues, en prenant toutefois en considération l'appartenance sectorielle des entreprises et les conditions d'avantages et de désavantages comparatifs correspondantes.

Nous arriverons enfin à l'analyse, au sein du groupe des entreprises exportatrices, du lien entre le type d'engagement à l'exportation de l'entreprise (exportations univoques, de gamme ou croisées) d'une part, et ses caractéristiques individuelles (taille, productivité et taux de marge) d'autre part.

2.1. Le rôle de l'appartenance sectorielle

Aux différentes modalités de l'échange identifiées dans la première partie correspondent des performances extérieures, mesurées par les taux de couverture correspondants, qui varient d'un produit à l'autre, comme le montre le tableau 7.

Les performances réalisées dans les échanges extérieurs sont déterminées, selon l'approche que nous adoptons, conjointement par des conditions collectives d'avantages et de désavantages comparatifs nationaux et par des phénomènes d'avantages et de désavantages spécifiques au niveau de l'entreprise, qui trouvent leur origine dans des conditions de concurrence imparfaite sur les marchés de facteurs, de biens intermédiaires et de produits finals.

Avant de passer au niveau de l'entreprise, nous avons voulu vérifier la pertinence des effets sectoriels collectifs de performance dans

Tableau 7 : Taux de couverture sectoriel et taux de couverture réalisés dans chaque modalité du commerce par produit (produits manufacturés, France-CEE, 1984)

Niveau	Produit	Total sectoriel	Commerce univoque	Commerce de gamme	Commerce croisé
A01	Minerais ferreux et non-ferreux	98	71	117	124
A02	Sable, matériaux concassés, pierres de construction, argile...	88	103	68	139
B01	Sidérurgie et première transformation de l'acier	85	106	94	79
B02	Métaux et demi-produits non-ferreux	92	20	173	109
B03	Verre	107	118	112	98
B04	Chimie minérale	46	31	57	58
B05	Chimie organique	69	21	64	112
B06	Fils et fibres synthétiques et artificels	47	2	31	119
B07	Fonderie et travail des métaux	63	21	64	85
B08	Papier-carton	81	36	76	102
B09	Caoutchouc	125	17	63	163
B10	Matières plastiques	49	7	46	72
B11	Produits de construction et céramique	59	31	67	88
C01	Machines agricoles	42	19	45	46
C02	Machines-outils	46	8	54	55
C03	Equipements industriels	59	33	65	67
C04	Matériel de manutention, pour les mines, la sidérurgie et le génie civil	82	40	55	120

Tableau 7 (suite)

Niveau	Produit	Total sectoriel	Commerce univoque	Commerce de gamme	Commerce croisé
C05	Instruments et matériels de précision	70	43	70	86
C06	Machines de bureau, matériel de traitement de l'information	65	6	78	85
C07	Matériel électrique	94	42	92	115
C08	Matériel électronique professionnel	76	4	110	68
D01	Matériel électronique ménager	35	0	63	43
D02	Equipement ménager	61	24	88	89
E01	Auto, moto, cycle	101	28	260	89
F01	Construction navale	115	>500	105	88
F02	Construction aéronautique	128	>500	494	14
F03	Matériel ferroviaire roulant	137	15	264	85
G01	Parachimie-pharmacie	104	110	125	84
G02	Textile	79	122	61	82
G03	Habillement	93	153	82	96
G04	Cuir et articles en cuir	45	3	101	81
G05	Chaussures	50	31	45	65
G06	Bois, meubles	49	31	47	74
G07	Presse, imprimerie, édition	45	0	52	45
G08	Jeux et jouets	45	5	44	70
G09	Articles de sport et de campement	109	150	84	112
G10	Bateaux de plaisance	210	>500	141	155
RES	Autres produits manufacturés	67	59	62	79
	Total industriel	76	35	88	87

les résultats de l'échange obtenus au niveau de chaque modalité du commerce considérée séparément. Cette vérification est effectuée à l'aide du calcul des coefficients de corrélation entre les performances sectorielles, exprimées en termes de taux de couverture, dans le commerce total France-CEE toutes modalités confondues, d'une part, et dans les échanges France-CEE correspondant à chaque modalité du commerce d'autre part. Nous considérons que des coefficients de corrélation positifs et significatifs entre le taux de couverture sectoriel réalisé dans chaque modalité, et le taux de couverture du secteur, impliquent l'existence d'un effet sectoriel dans la détermination de la performance extérieure observée au niveau de chaque modalité de l'échange. Les coefficients de corrélation obtenus sont présentés dans le tableau 8.

Tableau 8 : <u>Coefficients de corrélation de rang entre le taux de couverture du produit et les taux de couverture dans chaque modalité du commerce</u> (produits manufacturés, France-CEE, 1984)

	Commerce croisé	Commerce de gamme	Commerce univoque
Commerce total	0,58 **	0,74 **	0,67 **

** significatif au seuil de 1 %

Les coefficients positifs et significatifs présentés dans le tableau 8 confirment la pertinence d'un effet sectoriel collectif dans la détermination de la performance extérieure s'étendant à l'ensemble des modalités de l'échange. Les coefficients obtenus pour le commerce de gamme et pour le commerce univoque sont plus élevés que le coefficient correspondant au commerce croisé. Ceci suggère que l'influence de l'appartenance sectorielle est plus marquée dans le commerce de gamme et dans le commerce univoque. L'on peut même penser que la performance extérieure dans ces deux modalités correspond à des situations claires d'avantages et de désavantages comparatifs sectoriels. Un coefficient moins élevé dans le cas du commerce croisé semble indiquer que la performance extérieure dans cette modalité ne dépend que partiellement des conditions collectives d'avantages et de désavantages comparatifs sectoriels. Ceci conforte notre hypothèse du travail selon laquelle les résultats obtenus dans le commerce croisé dépendent aussi fortement des performances individuelles des firmes.

2.2. Les caractéristiques individuelles des entreprises

L'analyse couvre l'ensemble des entreprises françaises produisant des biens manufacturés recensées selon l'Enquête Annuelle d'Entreprise (E.A.E.) du ministère de l'Industrie et qui emploient un effectif de 20 personnes et plus (23.220 entreprises en 1984). En effet, les entreprises ayant un effectif de 10 à 19 personnes reçoivent un questionnaire simplifié qui ne nous permet pas d'évaluer les variables retenues dans cette étude. Les entreprises ayant un effectif inférieur à 10 ne sont pas interrogées. Sur les 23.220 entreprises de l'E.A.E. en 1984, les variables étudiées ne sont pas disponibles pour 946 d'entre elles. Il faut noter que pour ces dernières l'effectif employé est d'ailleurs très proche de 20. Le nombre d'entreprises qui entrent directement dans notre analyse est donc de 22.274 entreprises, employant un effectif total égal à 3.619.254 personnes.

L'ensemble de ces entreprises a été classé selon le découpage en 38 secteurs précédemment utilisé. Pour chaque entreprise les variables suivantes ont été calculées :

a) Le taux de marge : il s'agit de l'excédent brut d'exploitation rapporté à la valeur ajoutée de l'entreprise, qui indique en fait la part du revenu disponible pour la rémunération des capitaux internes et externes.

b) La productivité : il s'agit de la valeur ajoutée de l'entreprise par tête.

c) La taille de l'entreprise mesurée par l'effectif employé. Il est égal à la moyenne des effectifs salariés en fin de trimestre, corrigée pour les entreprises employant au moins 100 personnes du solde des effectifs pris en location et donnés en location.

Afin d'étudier les liens d'interdépendance entre taux de marge, productivité et taille de l'entreprise, tout en prenant en considération les conditions spécifiques à chaque secteur, nous avons étudié, d'une part, les relations de corrélation entre les trois variables, au niveau de l'entreprise, à l'intérieur de chaque secteur, et, d'autre part, les relations de corrélation entre les moyennes sectorielles des variables retenues d'un secteur à l'autre.

Le tableau 9 présente pour chacun des 38 secteurs constituant le champ des biens manufacturés, le nombre d'entreprises dans chaque secteur ainsi que les coefficients de corrélation Rpm (productivité - marge) Rpt (productivité - taille) et Rmt (marge - taille).

Les résultats obtenus montrent de manière claire le lien étroit entre le taux de marge réalisé par l'entreprise et sa productivité, dans le cadre d'un environnement sectoriel donné. Les coefficients de corrélation sont positifs et significatifs au seuil de 1 % dans 32 secteurs sur les 38 couvrant le champ de biens industriels. L'on peut donc conclure à une forte dépendance, généralisée à la grande majorité des secteurs, du taux de marge de l'entreprise à l'égard de sa productivité. D'autre part, le taux de marge ne semble pas être affecté par la taille de l'entreprise. Les coefficients de corrélation obtenus pour ces deux variables ne sont significatifs que dans 3 secteurs sur 38. Dans la grande majorité des secteurs, il semble donc qu'une entreprise de plus grande taille n'est pas synonyme d'une entreprise à fort profit.

Tableau 9 : Coefficients de corrélation entre les variables : taux de marge, productivité et taille de l'entreprise par secteur (production industrielle, France 1984)

Niveau	Produit	Nombre d'entreprises	Rpm	Rpt	Rmt
A01	Minerais ferreux et non-ferreux	65	0,26 *	0,08	-0,10
A02	Sable, matériaux concassés, pierres de construction, argile...	438	0,31 **	0,02	0,00
B01	Sidérurgie et première transformation de l'acier	183	0,47 **	0,00	-0,11
B02	Métaux et demi-produits non-ferreux	108	0,18	-0,03	0,06
B03	Verre	148	0,57 **	0,32 **	0,07
B04	Chimie minérale	104	0,66 **	0,16	-0,01
B05	Chimie organique	195	0,30 **	0,00	0,02
B06	Fils et fibres synthétiques et artificels	8	0,79 **	-0,17	-0,20
B07	Fonderie et travail des métaux	3.576	0,09 **	-0,01	0,04 **
B08	Papier-carton	602	0,51 **	0,26 **	0,12 **
B09	Caoutchouc	166	0,58 **	0,02	-0,07
B10	Matières plastiques	936	0,35 **	0,10 **	0,02
B11	Produits de construction et céramique	747	0,22 **	0,17 **	0,01
C01	Machines agricoles	266	0,58 **	0,04	-0,04
C02	Machines-outils	413	0,13 **	-0,05	-0,06
C03	Equipements industriels	1.894	0,08 **	0,15 **	0,00
C04	Matériel de manutention, pour les mines, la sidérurgie et le génie civil	390	0,30 **	0,05	-0,01

Tableau 9 (suite)

Niveau	Produit	Nombre d'entreprises	Rpm	Rpt	Kmt
C05	Instruments et matériels de précision	444	-0,02	0,06	0,00
C06	Machines de bureau, matériel de traitement de l'information	54	0,45 **	0,43 **	0,11
C07	Matériel électrique	699	0,27 **	0,08 *	0,00
C08	Matériel électronique professionnel	834	0,18 **	0,09 **	0,02
D01	Matériel électronique ménager	40	0,75 **	0,12	0,09
D02	Equipement ménager	97	0,77 **	-0,07	-0,07
E01	Auto, moto, cycle	639	0,01	0,04	-0,03
F01	Construction navale	82	0,37 **	-0,24 *	-0,21
F02	Construction aéronautique	82	0,33 **	0,46 **	0,03
F03	Matériel ferroviaire roulant	42	-0,03	-0,11	-0,17
G01	Parachimie-pharmacie	774	0,03	0,05	0,00
G02	Textile	1.725	0,23 **	-0,01	0,00
G03	Habillement	1.801	0,09 **	-0,05 *	0,00
G04	Cuire et articles en cuir	328	0,71 **	0,04	0,00
G05	Chaussures	405	0,51 **	0,15 **	0,11
G06	Bois, meubles	1.577	0,08 **	0,01	0,06
G07	Presse, imprimerie, édition	1.681	0,11 **	0,02	0,00
G08	Jeux et jouets	105	0,60 **	0,03	0,02
G09	Articles de sport et de campement	88	0,63 **	0,31 **	0,03
G10	Bateaux de plaisance	60	0,48 **	0,06	0,06
RES	Autres produits manufacturés	478	0,57 **	0,02	0,04
	Total industriel	22.274			

** significatif au seuil de 1 %

* significatif au seuil de 5 %

non significatif

En revanche, une certaine liaison apparait entre la productivité et la taille de l'entreprise. Les coefficients de corrélation sont positifs et significatifs dans 10 secteurs : Verre, Papier et carton, Matières plastiques, Produits de construction et céramique, Equipements industriels, Machines de bureau, matériel de traitement de l'information, Matériel électronique professionnel, Construction aéronautique, Chaussures, Articles de sport et de campement.

En résumé, les résultats obtenus tendent à montrer que <u>la productivité de l'entreprise est un élément certain dans la détermination de son taux de marge, que le taux de marge est indépendant de la taille de l'entreprise, et, enfin, que dans un certain nombre de secteurs la productivité de l'entreprise augmente avec sa taille</u>.

Nous allons à présent étudier les rapports qui s'établissent entre les trois variables considérées à travers les différents secteurs d'activités. Nous voulons en effet apprécier les liens d'interdépendance dans la variation des indicateurs retenus d'un secteur à l'autre. Pour ce faire nous avons calculé pour chaque secteur la productivité moyenne (total de la valeur ajoutée rapporté au total des effectifs), le taux de marge moyen (total EBE rapporté au total de la valeur ajoutée) et la taille moyenne (effectifs totaux rapportés au nombre d'entreprises). Les résultats obtenus sont présentés dans le tableau 10.

Les coefficients de corrélation, au niveau des 38 secteurs considérés, entre la productivité, le taux de marge et la taille moyens sont les suivants :

. Productivité - Taux de marge : 0,65, significatif au seuil de 1 %

. Productivité - Taille : 0,44, significatif au seuil de 1 %

. Taux de marge - Taille : - 0,05, non significatif.

Ces résultats viennent en fait confirmer ceux que nous avons obtenus auparavant. Aussi bien dans l'étude à l'intérieur de chaque secteur

Tableau 10 : Productivité, taux de marge et taille moyens des entreprises par secteur (produits manufacturés, France 1984)

Niveau	Secteurs	Nombre d'entreprises	Productivité moyenne (10^3 FF)	Taux de marge (%) moyen	Taille moyenne de l'entreprise
A01	Minerais ferreux et non-ferreux	65	245	30,0	254
A02	Sable, matériaux concassés, pierres de construction, argile...	438	199	28,7	52
B01	Sidérurgie et première transformation de l'acier	183	171	-1,0	783
B02	Métaux et demi-produits non-ferreux	108	334	44,2	526
B03	Verre	148	207	22,5	377
B04	Chimie minérale	104	296	30,4	316
B05	Chimie organique	195	369	42,5	432
B06	Fils et fibres synthétiques et artificels	8	125	-27,4	994
B07	Fonderie et travail des métaux	3.576	159	13,2	90
B08	Papier-carton	602	207	25,9	163
B09	Caoutchouc	166	157	10,2	536
B10	Matières plastiques	936	181	25,6	98
B11	Produits de construction et céramique	747	205	26,1	119
C01	Machines agricoles	266	163	16,9	115
C02	Machines-outils	413	160	4,2	108
C03	Equipements industriels	1.894	193	17,6	101
C04	Matériel de manutention, pour les mines, la sidérurgie et le génie civil	390	176	9,9	148

Tableau 10 (suite)

Niveau		Nombre d'entreprises	Productivité moyenne (10^3 FF)	Taux de profit moyen (%)	Taille moyenne de l'entreprise
C05	Instruments et matériels de précision	444	174	18,3	131
C06	Machines de bureau, matériel de traitement de l'information	54	452	43,7	1.035
C07	Matériel électrique	699	183	16,3	290
C08	Matériel électronique professionnel	834	215	21,0	265
D01	Matériel électronique ménager	40	157	15,5	428
D02	Equipement ménager	97	152	16,9	549
E01	Auto, moto, cycle	639	166	8,4	682
F01	Construction navale	82	83	-63,0	327
F02	Construction aéronautique	82	307	32,7	1.394
F03	Matériel ferroviaire roulant	42	150	2,8	290
G01	Parachimie-pharmacie	774	247	26,2	232
G02	Textile	1.725	142	21,6	133
G03	Habillement	1.801	109	13,2	87
G04	Cuir et articles en cuir	328	147	22,3	71
G05	Chaussures	405	127	17,7	158
G06	Bois, meubles	1.577	139	15,4	76
G07	Presse, imprimerie, édition	1.681	212	17,6	88
G08	Jeux et jouets	105	163	24,8	111
G09	Articles de sport et de campement	88	168	26,8	101
G10	Bateaux de plaisance	60	147	22,4	109
RES	Autres produits manufacturés	478	169	19,5	80
	Total industriel	22.274			

que dans l'étude entre les secteurs, le taux de marge est fortement dépendant de la productivité, la taille de l'entreprise exerçe un certain effet, non systématique, sur la productivité de l'entreprise, aucun lien, sauf dans quelques cas limités, n'apparait entre la taille de l'entreprise et son taux de marge.

2.3. <u>Les entreprises engagées à l'exportation sur le marché communautaire</u>

Nous allons maintenant nous intéresser de près aux entreprises françaises exportatrices sur le marché de la Communauté européenne. Nous essayerons, dans un premier temps, d'étudier leurs caractéristiques spécifiques, et de les comparer, dans un second temps, aux autres entreprises. L'objectif est de faire apparaitre d'éventuelles différences entre les deux groupes en termes de productivité, taille et taux de marge. Etant donné que nous considérons que l'engagement à l'exportation dépend aussi bien de la performance spécifique de l'entreprise que des conditions sectorielles collectives d'avantages et de désavantages comparés, nous distinguons dans notre analyse les secteurs bénéficiant d'avantages comparés des secteurs marqués par des désavantages comparatifs.

Sur le plan empirique, nous considérons que les entreprises françaises engagées à l'exportation sur le marché communautaire sont celles pour lesquelles la propension à l'exportation vers le Marché commun (exportation CEE/Chiffre d'affaires H.T.) est supérieure à 10 %. D'autre part, l'indicateur utilisé pour apprécier les conditions d'avantages et de désavantages comparatifs sectoriels dans les échanges commerciaux de la France au sein du Marché commun, est le bi-rapport entre la part des exportations françaises vers la CEE d'un secteur donné dans les exportations totales intra-CEE de ce secteur, et la part des exportations manufacturières françaises totales vers la CEE dans le total des exportations intra-communautaires de produits industriels.

Un indice supérieur à 1, pour un secteur donné, indiquera que la part détenue par la France dans les exportations intra-CEE des biens produits par ce secteur est supérieure à sa part totale dans les exportations manufacturières à l'intérieur du Marché commun. Il s'agit donc d'un indicateur d'avantages comparatifs révélés. Par convention les secteurs sont répartis en trois groupes. Le premier regroupe les secteurs ayant un indicateur inférieur à 0,85 (cas de désavantages comparatifs), le deuxième les secteurs ayant un indicateur compris entre 0,85 et 1,15 (cas des secteurs neutres), et le troisième regroupe les secteurs pour lesquels la valeur de l'indice correspondant est supérieure à 1,15 (cas d'avantages comparés).

Les tableaux 11.a, 11.b et 11.c présentent dans les cas des secteurs à désavantages, des secteurs neutres, et des secteurs à avantages comparatifs révélés, respectivement, la productivité, le taux de marge et la taille moyens des entreprises exportatrices et des entreprises non exportatrices par secteur, ainsi que les écarts de productivité, de taux de marge et de taille moyens des entreprises entre les deux groupes.

Les résultats obtenus apportent d'importantes informations concernant la comparaison entre les caractéristiques des entreprises exportatrices et des entreprises non-exportatrices sur le marché communautaire en lien avec les conditions d'avantages et de désavantages comparatifs sectoriels. Ces informations peuvent être résumées de la manière suivante :

a) Au niveau de l'ensemble industriel, il apparait qu'à l'exportation correspond une productivité supérieure. La productivité moyenne du groupe des 2.992 entreprises exportatrices (206 mille francs par tête) dépasse de 23 mille francs par tête la productivité du groupe de 19.282 entreprises non-exportatrices (183 mille francs). L'engagement à l'exportation semble aussi s'accompagner d'un taux de marge plus élevé (23,3 % pour le groupe des entreprises exportatrices contre 18,4 % pour le groupe des entreprises non-exportatrices). Mais la différence la plus importante entre les deux groupes apparait au niveau de la taille moyenne de l'entreprise. La taille moyenne dans le groupe des entreprises exportatrices (429 employés) est trois fois et demie plus élevée que la taille moyenne des entreprises non-exportatrices (121 personnes).

b) Les conditions d'avantages et de désavantages comparatifs affectent, et la productivité, et le taux de marge, et la taille moyens de

Tableau 11.a : Les écarts de productivité, de taux de marge et de taille moyens entre les entreprises exportatrices et les entreprises non-exportatrices (produits manufacturés, France-CEE, 1984)

(secteurs à désavantages comparés)

Niveau	Secteurs	Entreprises non-exportatrices				Entreprises exportatrices				Ecart de productivité (10³FF)	Ecart de taux de marge (points %)	Ecart de taille
		n	Productivité moyenne (10³FF)	Taux de marge moyen (%)	Taille moyenne	n	Productivité moyenne (10³FF)	Taux de marge moyen (%)	Taille moyenne			
D01	Matériel électronique ménager	31	148	13,2	421	9	186	21,4	452	38	8,2	30
G05	Chaussures	335	119	12,8	122	70	141	25,0	332	22	12,3	210
A01	Minerais ferreux et non-ferreux	50	239	17,8	289	15	287	39,3	138	48	21,5	-151
C02	Machines-outils	332	161	5,2	88	81	158	2,2	192	-3	-3,0	104
F01	Construction navale	79	82	-64,3	337	3	186	-1,9	81	104	62,4	-256
F03	Matériel ferroviaire roulant	41	148	2,3	291	1	241	16,7	230	93	14,4	-61
G04	Cuir et articles en cuir	257	141	21,5	63	71	159	24,1	100	17	2,6	37
B10	Matières plastiques	811	171	24,3	83	125	207	28,4	133	36	4,1	109
G06	Bois, meubles	1.462	138	16,1	70	115	142	12,0	160	4	-4,1	91
C03	Equipements industriels	1.670	188	15,7	89	224	209	23,6	194	21	8,0	105
G03	Habillement	1.623	103	10,8	84	178	151	24,0	116	48	13,2	32
B11	Produits de construction et céramique	677	212	27,4	104	70	179	20,5	267	-33	-6,9	163
B07	Fonderie et travail des métaux	3.241	157	12,9	77	335	165	14,0	218	8	1,1	141
B06	Fils et fibres synthétiques et artificiels	5	128	-14,0	979	3	119	-50,6	1.019	-9	-36,6	40
B04	Chimie minérale	81	268	24,8	287	23	363	40,5	417	95	15,7	130
	Total	10.695	157	15,0	89	1.323	180	20,6	199	23	5,6	91

Tableau 11.b : Les écarts de productivité, de taux de marge et de taille moyens entre les entreprises exportatrices et les entreprises non-exportatrices (produits manufacturés France-CEE, 1984)

(secteurs neutres)

Niveau	Secteurs	Entreprises non-exportatrices				Entreprises exportatrices				Ecart de productivité (10³FF)	Ecart de taux de marge (pointes %)	Ecart de taille
		n	Productivité moyenne (10³FF)	Taux de marge moyen (%)	Taille moyenne	n	Productivité moyenne (10³FF)	Taux de marge moyen (%)	Taille moyenne			
G08	Jeux et jouets	90	148	20,2	85	15	191	31,7	265	42	11,5	179
C06	Machines de bureau, matériel de traitement de l'infor.	43	264	22,2	266	11	500	46,6	4.040	236	24,4	3.773
D02	Equipement ménager	71	146	14,5	471	26	161	20,6	759	15	6,1	288
G07	Presse, imprimerie, édition	1.681	212	17,6	88	0	-	-	-	-	-	-
C01	Machines agricoles	227	157	17,9	73	39	170	15,9	362	13	-2,0	290
B05	Chimie organique	94	336	42,2	269	101	383	42,6	584	47	0,4	314
F02	Construction aéronautique	69	310	32,9	1.567	13	252	27,0	478	-58	-5,9	-1.089
C05	Instruments et matériels de précision.	340	162	12,4	89	104	187	23,8	271	26	11,4	182
RES	Autres produits manufacturés	423	169	19,6	70	55	169	18,9	157	0	-0,7	87
G02	Textile	1.298	135	21,1	91	427	150	22,1	260	15	0,9	169
A02	Sable, matériaux concassés, pierres de const., argile...	401	201	28,5	48	37	188	29,9	91	-14	1,5	43
C04	Matériel de manutention, pour les mines, la sidérurgie et le génie civil	321	171	8,4	111	69	185	12,0	323	14	3,5	212
C08	Matériel électronique professionnel	721	215	19,8	234	113	215	24,9	458	0	5,1	223
E01	Auto, moto, cycle	513	158	9,6	311	126	170	7,8	2.190	11	-1,8	1.878
	Total	6.292	200	21,0	145	1.136	214	24,5	571	14	3,5	426

Tableau 11.c : Les écarts de productivité, de taux de marge et de taille moyens entre les entreprises exportatrices et les entreprises non-exportatrices (produits manufacturés, France-CEE, 1984)

(secteurs à avantages comparatifs)

Niveau	Secteurs	Entreprises non-exportatrices				Entreprises exportatrices				Ecart de productivité (10³FF)	Ecart de taux de marge (points %)	Ecart de taille
		n	Productivité moyenne (10³FF)	Taux de marge moyen (%)	Taille moyenne	n	Productivité moyenne (10³FF)	Taux de marge moyen (%)	Taille moyenne			
C07	Matériel électrique	620	185	15,5	257	79	179	19,2	545	-5	3,7	288
G01	Parachimie-pharmacie	639	235	22,9	181	135	270	31,6	472	35	8,7	291
B08	Papier-carton	518	187	23,6	124	84	245	29,2	400	58	5,5	275
B01	Sidérurgie et première transformation de l'acier	132	188	4,2	488	51	158	-5,6	1.546	-30	-9,8	1.058
B02	Métaux et demi-produits non-ferreux	54	365	43,3	284	54	322	44,6	768	-44	1,3	483
B03	Verre	108	213	20,8	222	40	203	23,8	793	-10	3,0	571
G09	Articles de sport et de campement	60	149	22,4	71	28	186	30,0	164	37	7,6	93
B09	Caoutchouc	122	122	-2,9	147	44	166	12,6	1.614	43	15,6	1.467
G10	Bateaux de plaisance	42	131	19,1	57	18	157	24,0	230	26	4,8	173
	Total	2.295	202	18,8	204	533	211	22,9	698	9	4,1	494
	Total industriel	19.282	183	18,4	121	2.992	206	23,3	429	23	4,9	308

l'entreprise. Le groupe des entreprises appartenant aux secteurs à désavantages comparés (12.018 entreprises) montre une productivité moyenne de 162 mille francs par tête, un taux de marge moyen de 16,3 % et une taille moyenne de 101 personnes par entreprise. Dans le groupe des secteurs à avantages comparés, les entreprises (2.828 entreprises) réalisent une productivité moyenne de 206 mille francs par personne, un taux de marge de 20,6 %. Elles sont d'une taille moyenne égale à 297 employés.

c) Il est d'un grand intérêt de comparer la différence entre les entreprises exportatrices et les entreprises non-exportatrices dans le groupe des secteurs à désavantages comparés et dans le groupe des secteurs à avantages comparés. Sur ce point, les résultats obtenus sont très démonstratifs. En moyenne, la productivité d'une entreprise exportatrice, dans des conditions de désavantages comparés, dépasse de 23 mille francs par tête la productivité d'une entreprise non-exportatrice, soit 15 % de plus. Or, pour une entreprise exportatrice dans des conditions d'avantages comparés, la productivité moyenne n'est supérieure que de 9 mille francs, soit 4,5 % de plus qu'une entreprise non-exportatrice. Bien que cela soit moins marqué que dans le cas de la productivité, l'écart, en termes de taux de marge, entre les entreprises exportatrices et non-exportatrices, est plus élevé dans le groupe des secteurs à désavantages comparés (5,6 points de pourcentage) que dans le groupe des secteurs à avantages comparés (4,1 points de pourcentage). Nous en concluons que, dans des conditions économiques collectives d'infériorité relative nationale, les entreprises exportatrices sont celles qui ont réussi à se doter d'une performance spécifique, en matière de productivité, qui leur permet d'entrer en concurrence sur les marchés extérieurs. Il faut noter à cet égard qu'en matière de taille, la taille moyenne des entreprises exportatrices dans les secteurs à désavantages (199 employés), qui ne dépasse les non-exportatrices que de 91 personnes, est largement inférieure à la taille moyenne des entreprises exportatrices dans les secteurs à avantages comparés (698), supérieure aux non-exportatrices, dans les mêmes secteurs, de 494 personnes. Les entreprises qui, grâce à une productivité exceptionnelle, arrivent à exporter, malgré des conditions collectives sectorielles défavorables, ne se distiguent pas par une taille particulièrement élevée.

2.4. Les caractéristiques des entreprises et les types d'engagement à l'exportation

Du point de vue de l'entreprise, le type d'engagement à l'exportation (univoque, de gamme, croisé) est loin d'être indifférent. En effet, dans le cas des exportations univoques, l'entreprise a déjà atteint, vis-à-vis de ses concurrents étrangers, un stade de monopole assez avancé, ce qui est, en toute vraisemblance, le témoin d'une capacité compétitive supérieure. Au risque de nous répéter, nous devons souligner que la situation est différente selon qu'il s'agit d'une entreprise opérant dans des conditions sectorielles d'avantages ou de désavantages comparés. Si on nous accorde que la capacité concurrentielle au niveau de l'entreprise repose à la fois sur les conditions collectives de son environnement sectoriel et sur ses efforts compétitifs spécifiques, il en résulte que l'intensité des efforts spécifiques, pour une enteprise engagée dans des exportations univoques, devra être supérieure dans le cas de conditions sectorielles de désavantages comparatifs.

Dans le commerce de gamme, nous devons distinguer le cas où les flux d'exportations de l'entreprise portent sur des catégories de produits haut de gamme, du cas où ces flux sont constitués des catégories de bas de gamme ou de gamme moyenne. Même si dans ces deux derniers cas, par définition, les catégories exportées ne figurent pas dans la liste des importations, il semble plus conforme à la réalité de l'entreprise de parler d'une capacité concurrentielle supérieure par rapport aux concurrents étrangers dans le cas des exportations des catégories de haut de gamme.

Le cas des entreprises engagées à l'exportation dans des échanges croisés de produits similaires ne peut pas être appréhendé sans prendre en considération les conditions d'avantages et de désavantages comparés au niveau des secteurrs. Les activités auxquelles correspondent des conditions de désavantages comparés sont normalement importatrices. Des flux inverses d'exportations reflètent donc une situation de sur-compétitivité au niveau de l'entreprise exportatrice, qui lui permet d'entrer en concurrence avec les entreprises étrangères. La situation est complètement différente dans le cas des échanges croisés de produits similaires effectués dans des activités qui sont caractérisées par des conditions d'avantages comparés. Ces activités, normalement exportatrices, font cependant l'objet de flux inverses d'importations.

L'on devrait donc s'attendre à ce que le phénomène de sur-compétitivité de firmes apparaisse plutôt dans le cas des entreprises appartenant à des secteurs caractérisés par des conditions collectives de désavantages comparés particulièrement pour les échanges croisés bilatéraux. Dans ce cas en effet, l'entreprise exportatrice réussit à entrer en concurrence sur le marché même des pays origines des importations. Le phénomène des échanges croisés triangulaires peut en revanche correspondre à d'autres éléments explicatifs, tels que la hiérarchisation des avantages comparés.

Sur le plan méthodologique, nous avons mis en correspondance le fichier statistique des Douanes françaises avec le fichier "Nimexe" du Marché commun. Dans l'analyse des modalités du commerce de l'économie française effectuée dans la première partie, chaque flux au niveau du produit Nimexe à 6 chiffres destiné à, ou en provenance de, chaque partenaire de la France, a été classé selon la modalité du commerce à laquelle il correspond. A l'aide des statistiques des Douanes, qui nous fournissent les exportations par entreprise, produit et destination, chaque flux, au niveau de l'entreprise, a pu être identifié selon sa modalité de commerce. Il a donc été possible d'évaluer, pour chaque entreprise, la part de ses exportations correspondant à tel ou tel type d'échanges. Ensuite, la mise sur un même fichier des statistiques de l'E.A.E. et des statistiques des Douanes a permis de disposer pour chaque entreprise de ses caractéristiques économiques et de ses types d'engagement à l'exportation.

Dans chaque secteur d'activités, et au niveau de groupes de secteurs, nous avons calculé la productivité moyenne, le taux de marge moyen et la taille moyenne des entreprises exportatrices selon leur type d'engagement à l'exportation.

Ainsi pour une modalité g d'engagement à l'exportation, la productivité moyenne des entreprises appartenant à un secteur donné, ou à un groupe de secteurs, est égale à :

$$PRODMg = \frac{\sum_{i \in I} VAi \left(\frac{Xgi}{Xti}\right)}{\sum_{i \in I} EFi \left(\frac{Xgi}{Xti}\right)}$$

où :

I : ensemble des entreprises du secteur, ou groupe de secteurs, concerné dont plus de 10 % du chiffre d'affaires est exporté vers la Communauté.

PRODMg : la productivité moyenne des entreprises dans un secteur donné, ou dans un groupe de secteurs, engagées à l'exportation selon la modalité g.

VAi : la valeur ajoutée de l'entreprise i.

Xgi : les exportations intra-communautaires de l'entreprise i correspondant à la modalité g.

Xti : les exportations intra-communautaires totales de l'entreprise i.

EFi : l'effectif employé par l'entreprise i.

Le taux de marge moyen des entreprises pour la modalité g sera égal à :

$$MARGMg = \frac{\sum_{i \in I} EBEi \left(\frac{Xgi}{Xti}\right)}{\sum_{i \in I} VAi \left(\frac{Xgi}{Xti}\right)}$$

où :

MARGMg : taux de marge moyen des entreprises du secteur ou groupe de secteurs concerné, engagées à l'exportation selon la modalité g.

EBEi : l'excédent brut d'exploitation de l'entreprise i.

La taille moyenne des entreprises engagée à l'exportation selon la modalité g sera égale à la somme de leurs effectifs divisée par leur nombre.

Le tableau 12 présente les résultats obtenus au niveau des groupes de secteurs à désavantages, à absence d'avantages et à avantages comparés. Les résultats détaillés par secteur se trouvent en annexe.

Les résultats obtenus montrent, pour le groupe des secteurs à désavantages comparés, un niveau de performance supérieur pour les entreprises engagées dans des exportations univoques. Ceci se traduit à la fois par une productivité supérieure et un taux de marge supérieur. Bien que dans le groupe des secteurs à avantages comparés la productivité et le taux de marge correspondant aux exportations univoques soient aussi supérieurs, leurs écarts par rapport aux entreprises non exportatrices sont beaucoup plus faibles. L'on peut donc en conclure que l'engagement extérieur d'une entreprise par des exportations univoques nécessite, lorsque l'entreprise appartient à un secteur à désavantages comparés, une performance spécifique particulièrement élevée.

Tableau 12.a : Productivité, taux de marge et taille moyens des entreprises selon le type d'engagement à l'exportation (produits manufacturés, France-CEE, 1984)

(secteurs à désavantages comparés)

Types d'engagement à l'exportation		Productivité moyenne (10^3 FF)	Taux de marge moyen (%)	Taille moyenne	Ecarts par rapport aux entreprises non-exportatrices		
					de productivité (10^3 FF)	de taux de marge (points%)	de taille
Exportations dans les échanges croisés	bilatéraux	185	20,2	231	28	5,2	142
	triangulaires	172	18,7	213	15	3,7	124
Commerce de gamme	exportations haut de gamme	182	23,3	230	25	8,3	141
	exportations de bas de gamme et de gamme moyenne	175	19,7	215	18	4,7	126
Exportations univoques		196	23,6	292	39	8,6	203
Absence d'exportations		157	15,0	89			

Tableau 12.b : Productivité, taux de marge et taille moyens des entreprises selon le type d'engagement à l'exportation (produits manufacturés, France-CEE, 1984)

(secteurs meutres)

Types d'engagement à l'exportation		Productivité moyenne (10^3FF)	Taux de marge moyen (%)	Taille moyenne	Ecarts par rapport aux entreprises non-exportatrices		
					de productivité (10^3FF)	de taux de marge (points%)	de taille
Exportations dans un échange croise		211	23,3	592	11	2,3	447
Commerce de gamme	exportations haut de gamme	260	32,8	649	60	11,8	504
	exportations de bas de gamme et de gamme moyenne	191	18,4	633	-9	-2,6	488
Exportations univoques		189	21,9	856	-11	0,9	711
Absence d'exportations		200	21,0	145			

Tableau 12.c : Productivité, taux de marge et taille moyens des entreprises selon le type d'engagement à l'exportation (produits manufacturés, France-CEE, 1984)

(secteurs à avantages comparés)

Types d'engagement à l'exportation		Productivité moyenne (10^3 FF)	Taux de marge moyen (%)	Taille moyenne	Ecarts par rapport aux entreprises non-exportatrices		
					de productivité (10^3 FF)	de taux de marge (points%)	de taille
Exportations dans un échange croisé		213	23,7	713	11	4,9	502
Commerce de gamme	exportations haut de gamme	216	23,8	759	14	5,0	555
	exportations de bas de gamme et de gamme moyenne	200	18,6	750	-2	-0,2	546
Exportations univoques		219	26,4	1.106	17	7,6	902
Absence d'exportations		202	18,8	204			

Ces résultats font apparaitre aussi les performances spécifiques des entreprises exportatrices des catégories de produits haut de gamme dans les échanges de gamme, avec encore un degré de performance plus élevé dans le groupe des secteurs à désavantages comparés. Il semble donc que l'engagement à l'exportation selon cette modalité nécessite que l'entreprise dispose d'avantages concurrentiels, ce qui ne saurait se construire sans des efforts de productivité et de rentabilité dans l'entreprise.

L'engagement à l'exportation par des flux de produits bas de gamme et de gamme moyenne correspond, dans le groupe des secteurs à désavantages comparés, à un niveau de performance qui, bien que supérieur à celui des entreprises non exportatrices, n'est pas spécialement élevé. Dans le groupe des secteurs à avantages comparés, l'engagement à l'exportation selon cette modalité correspond même à une performance inférieure à celle des entreprises non-exportatrices.

Les exportations dans les échanges croisés de produits similaires, dans le groupe des secteurs à désavantages comparés, sont associées, dans le cas des échanges bilatéraux, à des niveaux élevés de performance. La productivité moyenne correspondante est la deuxième en importance après celle réalisée dans les exportations univoques. Ceci témoigne du niveau concurrentiel spécifique des entreprises qui réussissent, malgré des conditions sectorielles défavorables, à entrer en compétition avec les entreprises étrangères sur leurs propres marchés. Les exportations dans un échange croisé triangulaire, tout en s'associant à des écarts de productivité et de taux de marge positifs par rapport aux entreprises non-exportatrices, ne paraissent pas correspondre à des niveaux de performance très élevés des entreprises concernés. Dans le groupe des secteurs à avantage comparés, les entreprises qui sont concurrencées par des entreprises étrangères sur le marché domestique français, et qui se trouvent par conséquent situées à l'exportation sur des produits pour lesquels existent en même temps des importations connaissent des performances moyennes : la productivité correspondante est en troisième position après les exportations univoques et les exportations de haut de gamme.

Quant à la taille de l'entreprise, on peut remarquer qu'elle est beaucoup plus liée à l'appartenance sectorielle qu'à la modalité d'exportation. La variation de la taille moyenne entre les groupes de secteurs est visiblement plus importante que la variation de la taille moyenne à l'intérieur de chaque groupe selon le type d'engagement à l'exportation. Notons cependant que des exportations univoques sont associées à des tailles moyennes relativement plus élevées.

Conclusion

L'analyse approfondie du commerce extérieur que nous avons menée nous a conduit à mettre en évidence plusieurs modalités d'insertion dans le commerce international : des échanges univoques, des échanges de gamme et des échanges croisés de produits similaires, sous forme bilatérale ou triangulaire. L'intensité de chaque modalité varie d'un secteur d'activités à l'autre, de même que les performances associées à chacune d'entre elles.

L'étude statistique a montré une forte proportion de commerce croisé de produits similaires dans le commerce de la France avec ses partenaires de la Communauté économique européenne.

Plus de 80 % des échanges croisés bilatéraux de la France sont réalisés avec d'autres pays de la Communauté européenne, l'intensité de ce type d'échanges étant particulièrement élevée avec l'Allemagne et l'ensemble Belgique-Luxembourg.

L'étude a également montré l'existence d'un ordre hiérarchique en matière d'échanges croisés triangulaires de produits similaires. Dans ce domaine, la France apparait clairement comme un pays intermédiaire. Elle se trouve située entre deux groupes de partenaires : le premier comprend la RFA, la Belgique-Luxembourg et les Pays-Bas, le second le Royaume-Uni, l'Irlande, le Danemark et la Grèce. Dans cet ordre hiérarchique, l'Italie parait se situer approximativement au même niveau que la France.

De son côté, l'analyse des caractéristiques individuelles des entreprises a révélé le lien étroit entre taux de marge et productivité. Un lien significatif, mais partiel et non systématique, existe entre la taille de l'entreprise et sa productivité. Ce lien existe uniquement pour certains secteurs d'activités. Le rapport entre la taille de l'entreprise et sa productivité semble donc être conditionné par l'existence d'économies d'échelle dans certains secteurs. Enfin, il semble n'y avoir aucun lien entre la taille de l'entreprise et son taux de marge.

Dans l'ensemble, les entreprises françaises engagées à l'exportation sur le Marché commun montrent une productivité et un taux de marge plus élevés que les autres entreprises. La différence la plus importante apparait cependant au niveau de la taille moyenne, largement supérieure dans le groupe des entreprises exportatrices.

Ce constat doit être immédiatement nuancé. Dans le groupe des secteurs à désavantages comparés, les écarts entre le groupe des entreprises exportatrices et le groupe des entreprises non exportatrices sur le Marché commun sont spécialement importants en matière de productivité, et, en revanche, ils sont faibles en ce qui concerne la taille. Les entreprises qui, grâce à une productivité exceptionnelle, arrivent à exporter malgré des conditions sectorielles défavorables, ne se distinguent donc pas par une taille particulièrement élevée.

Le lien entre les caractéristiques de l'entreprise et le type de l'engagement à l'exportation s'établit de la manière suivante. Dans le groupe des secteurs à désavantages comparés, l'écart de productivité entre les entreprises exportatrices et les entreprises non exportatrices sur le Marché commun est le plus élevé dans le cas de l'engagement à l'exportation par des flux univoques. Viennent ensuite le commerce croisé bilatéral et les exportations haut de gamme.

L'écart de productivité est le moins élevé pour les exportations de produits de bas de gamme et de gamme moyenne ainsi que dans le commerce croisé triangulaire. Les écarts de taux de marge sont les plus élevés dans les exportations univoques et de produits haut de gamme. Ils sont moins importants dans les autres types d'engagement à l'exportation. Les écarts de taille ne sont en général pas discriminants entre les différentes modalités d'insertion dans le commerce.

Dans le groupe des secteurs à avantages comparés, les écarts de productivité et de taux de marge sont négatifs pour les entreprises exportatrices des produits de bas de gamme. Ils sont modérés pour les autres modalités, avec toutefois un écart supérieur pour les exportations univoques.

(1) A titre d'exemple, sont considérés comme des produits distincts les chambres à air pour vélocipèdes (401.121), pour motocycles (401.123), pour voitures particulières (401.127), pour camions (401.127), etc. ou encore, les tissus de coton contenant au moins 85 % en poids de coton d'une largeur inférieure à 85 cm écrus (550.901), blanchis (550.902), teints (550.903), fabriqués avec des fils de diverses couleurs (550.904), imprimés (550.905), etc.

(2) Pour qu'un produit exporté et un produit importé, correspondant à la même rubrique Nimexe à 6 chiffres, appartiennent à une même catégorie de gamme, nous avons, par convention, exigé que l'écart entre leurs valeurs unitaires soit inférieur à 15 %.

(3) Nous avons exigé que les flux à l'exportation et à l'importation soient significatifs l'un par rapport à l'autre. Les échanges où l'un des deux flux est inférieur à 10 % de l'autre ne sont pas pris en considération.

(4) A. Jacquemin et A. Sapir (1986) ont déjà mis en évidence l'existence de différences pour les pays membres de la CEE concernant les configurations de leur commerce intra et extra-européen.

(5) K.S. Abd El Rahman, "Hypothèses concernant le rôle des avantages comparatifs des pays et des avantages spécifiques des firmes", REP n° 2, 1987.

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ANNEXE

Résultats détaillés par secteur

Les tableaux présentés dans cette annexe contiennent les résultats détaillés portant sur la productivité, le taux de marge et la taille des entreprises dans chaque secteur. Les secteurs sont classés par ordre croissant selon le niveau de l'avantage comparé du secteur. Ces tableaux sont des sorties informatiques qui se lisent de la manière suivante :

En haut du tableau, pour chaque secteur, on trouve la valeur de l'indice d'avantage comparé correspondant à chaque secteur. Cet indice est calculé selon la formule suivante :

$$\frac{Xif}{X.f} \Big/ \frac{Xi.}{X..}$$

où

Xif : les exportations françaises intra-communautaires dans le secteur i.

X.f : le total des exportations de biens industriels de la France vers le Marché commun.

Xi. : les exportations totales intra-CEE dans le secteur i.

X.. : le total des exportations industrielles à l'intérieur du Marché commun.

Pour chaque secteur, on lit :

NIV40 : le code de nomenclature du secteur.

CLASS : "DESAV" dans le cas d'un secteur à désavantages comparés (indice inférieur à 0,85).
"NEUTR" dans le cas d'absence ou de faibles avantages et

désavantages comparés (0,85 < indice < 1,15).
"AVANT" dans le cas d'un secteur à avantages comparés (indice supérieur à 1,15).

SNT : nombre total d'entreprises dans le secteur.

SPRODT : productivité moyenne des entreprises du secteur (10^3 FF par employé).

SPROFT : taux de marge moyen des entreprises du secteur (en pourcentage).

STAILT : effectif moyen des entreprises du secteur.

SNN : nombre d'entreprises non-exportatrices sur le marché de la CEE.

SPRODN : productivité moyenne des entreprises non-exportatrices.

SPROFN : taux de marge moyen des entreprises non-exportatrices.

STAILN : effectif moyen des entreprises non-exportatrices.

SNX : nombre d'entreprises exportatrices sur le Marché commun.

SPRODX : productivité moyenne des entreprises exportatrices.

SPROFX : taux de marge moyen des entreprises exportatrices.

STAILX : effectif moyen des entreprises exportatrices.

TYPE : type d'engagement à l'exportation de l'entreprise.
- "UN" : exportations univoques,
- "HG" : exportations de haut de gamme,
- "MB" : exportations de gamme moyenne et bas de gamme,
- "BI" : exportations dans un commerce croisé bilatéral,
- "TR" : exportations dans un commerce croisé triangulaire,
- "CR" : exportations dans un commerce croisé bilatéral ou triangulaire.

PRODI : productivité moyenne pondérée par le poids relatif des exportations du type i dans les exportations totales de l'entreprise.

PROFI : taux de marge moyen pondéré par le poids relatif des exportations du type i dans les exportations totales de l'entreprise.

TAILEI : la taille moyenne des entreprises engagées à l'exportation selon le type i.

ECARTP : PRODI - SPRODN.

ECARTF : PROFI - SPROFN.

ECARTT : TAILEI - STAILN.

Le dernier tableau représente les résultats agrégés par groupe de secteurs : "secteurs à désavantages comparés", "secteurs neutres" et "secteurs à avantages comparatifs".

PRODUCTIVITE, TAUX DU PROFIT, ET TAILLE MOYENS DES
ENTREPRISES SELON LEURS TYPES D'ENGAGEMENT A
L'EXPORTATION (PRODUITS MANUFACTURES, FRANCE-CEE, 1984)

INDICE=0.4843457

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX	TYPE		PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
D01	DESAV	40	157	15.5	428	31	148	13.2	421	9	186	21.4	452	1	UN	208	5.4	999	61	-7.7	578
D01	DESAV	40	157	15.5	428	31	148	13.2	421	9	186	21.4	452	2	HG	177	29.1	504	30	15.9	82
D01	DESAV	40	157	15.5	428	31	148	13.2	421	9	186	21.4	452	3	MB	186	21.9	486	38	8.7	64
D01	DESAV	40	157	15.5	428	31	148	13.2	421	9	186	21.4	452	4	BI	199	6.2	594	52	-7.0	172
D01	DESAV	40	157	15.5	428	31	148	13.2	421	9	186	21.4	452	5	TR	202	11.5	486	54	-1.7	64
D01	DESAV	40	157	15.5	428	31	148	13.2	421	9	186	21.4	452	6	CR	201	8.7	486	53	-4.5	64

INDICE=0.6280041

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX	TYPE		PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
G05	DESAV	405	127	17.7	158	335	119	12.8	122	70	141	25.0	332	1	UN	148	20.3	406	29	7.5	284
G05	DESAV	405	127	17.7	158	335	119	12.8	122	70	141	25.0	332	2	HG	147	27.0	402	27	14.2	280
G05	DESAV	405	127	17.7	158	335	119	12.8	122	70	141	25.0	332	3	MB	127	22.0	344	8	9.2	223
G05	DESAV	405	127	17.7	158	335	119	12.8	122	70	141	25.0	332	4	BI	144	28.4	403	25	15.6	282
G05	DESAV	405	127	17.7	158	335	119	12.8	122	70	141	25.0	332	5	TR	141	25.0	353	22	12.2	231
G05	DESAV	405	127	17.7	158	335	119	12.8	122	70	141	25.0	332	6	CR	142	26.0	349	23	13.2	227

INDICE=0.6323307

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX	TYPE		PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
A01	DESAV	65	245	21.0	254	50	239	17.8	289	15	287	39.3	138	1	UN	319	40.6	257	80	22.8	-32
A01	DESAV	65	245	21.0	254	50	239	17.8	289	15	287	39.3	138	2	HG	274	39.8	139	35	21.9	-149
A01	DESAV	65	245	21.0	254	50	239	17.8	289	15	287	39.3	138	3	MB	282	37.7	212	42	19.9	-76
A01	DESAV	65	245	21.0	254	50	239	17.8	289	15	287	39.3	138	4	BI	219	43.5	319	-20	25.7	30
A01	DESAV	65	245	21.0	254	50	239	17.8	289	15	287	39.3	138	5	TR	254	36.5	198	14	18.7	-91
A01	DESAV	65	245	21.0	254	50	239	17.8	289	15	287	39.3	138	6	CR	243	38.4	182	4	20.6	-107

PRODUCTIVITE, TAUX DU PROFIT, ET TAILLE MOYENS DES ENTREPRISES SELON LEURS TYPES D'ENGAGEMENT A L'EXPORTATION (PRODUITS MANUFACTURES, FRANCE-CEE, 1984)

INDICE=0.6615363

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX		TYPE	PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
C02	DESAV	413	160	4.2	108	332	161	5.2	88	81	158	2.2	192	1	UN	117	-14.9	400	-44	-20.1	312
C02	DESAV	413	160	4.2	108	332	161	5.2	88	81	158	2.2	192	2	HG	159	7.4	213	-3	2.2	125
C02	DESAV	413	160	4.2	108	332	161	5.2	88	81	158	2.2	192	3	MB	154	0.8	194	-7	-4.4	106
C02	DESAV	413	160	4.2	108	332	161	5.2	88	81	158	2.2	192	4	BI	159	2.3	212	-2	-2.9	124
C02	DESAV	413	160	4.2	108	332	161	5.2	88	81	158	2.2	192	5	TR	165	1.3	199	4	-3.9	112
C02	DESAV	413	160	4.2	108	332	161	5.2	88	81	158	2.2	192	6	CR	163	1.7	198	2	-3.5	110

INDICE=0.6785562

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX		TYPE	PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
F01	DESAV	82	83	-63.0	327	79	82	-64.3	337	3	186	-1.9	81	1	UN	.	.	.	.	.	.
F01	DESAV	82	83	-63.0	327	79	82	-64.3	337	3	186	-1.9	81	2	HG	154	-4.9	110	72	59.4	-227
F01	DESAV	82	83	-63.0	327	79	82	-64.3	337	3	186	-1.9	81	3	MB	294	0.1	67	212	64.4	-270
F01	DESAV	82	83	-63.0	327	79	82	-64.3	337	3	186	-1.9	81	4	BI	154	-0.6	81	72	63.7	-256
F01	DESAV	82	83	-63.0	327	79	82	-64.3	337	3	186	-1.9	81	5	TR	294	0.1	67	212	64.4	-270
F01	DESAV	82	83	-63.0	327	79	82	-64.3	337	3	186	-1.9	81	6	CR	208	-0.2	81	126	64.1	-256

INDICE=0.6930969

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX		TYPE	PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
F03	DESAV	42	150	2.8	290	41	148	2.3	291	1	241	16.7	230	1	UN	.	.	.	.	.	.
F03	DESAV	42	150	2.8	290	41	148	2.3	291	1	241	16.7	230	2	HG	241	16.7	230	93	14.4	-61
F03	DESAV	42	150	2.8	290	41	148	2.3	291	1	241	16.7	230	3	MB	241	16.7	230	93	14.4	-61
F03	DESAV	42	150	2.8	290	41	148	2.3	291	1	241	16.7	230	4	BI	241	16.7	230	93	14.4	-61
F03	DESAV	42	150	2.8	290	41	148	2.3	291	1	241	16.7	230	5	TR	241	16.7	230	93	14.4	-61
F03	DESAV	42	150	2.8	290	41	148	2.3	291	1	241	16.7	230	6	CR	241	16.7	230	93	14.4	-61

PRODUCTIVITE, TAUX DU PROFIT, ET TAILLE MOYENS DES ENTREPRISES SELON LEURS TYPES D'ENGAGEMENT A L'EXPORTATION (PRODUITS MANUFACTURES, FRANCE-CEE, 1984)

INDICE=0.7047433

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX	TYPE		PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
G04	DESAV	328	147	22.3	71	257	141	21.5	63	71	159	24.1	100	1	UN	172	21.5	183	30	-0.0	120
G04	DESAV	328	147	22.3	71	257	141	21.5	63	71	159	24.1	100	2	HG	135	22.1	131	-7	0.6	67
G04	DESAV	328	147	22.3	71	257	141	21.5	63	71	159	24.1	100	3	MB	170	27.6	106	28	6.1	42
G04	DESAV	328	147	22.3	71	257	141	21.5	63	71	159	24.1	100	4	BI	147	18.0	148	6	-3.5	85
G04	DESAV	328	147	22.3	71	257	141	21.5	63	71	159	24.1	100	5	TR	142	21.0	112	1	-0.5	49
G04	DESAV	328	147	22.3	71	257	141	21.5	63	71	159	24.1	100	6	CR	144	19.8	112	3	-1.7	49

INDICE=0.7052335

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX	TYPE		PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
B10	DESAV	936	181	25.6	98	811	171	24.3	83	125	207	28.4	193	1	UN	248	33.6	306	77	9.3	223
B10	DESAV	936	181	25.6	98	811	171	24.3	83	125	207	28.4	193	2	HG	232	34.1	223	61	9.7	140
B10	DESAV	936	181	25.6	98	811	171	24.3	83	125	207	28.4	193	3	MB	202	27.7	200	30	3.3	117
B10	DESAV	936	181	25.6	98	811	171	24.3	83	125	207	28.4	193	4	BI	210	27.8	214	38	3.4	130
B10	DESAV	936	181	25.6	98	811	171	24.3	83	125	207	28.4	193	5	TR	197	26.5	193	26	2.1	109
B10	DESAV	936	181	25.6	98	811	171	24.3	83	125	207	28.4	193	6	CR	201	26.9	193	30	2.6	109

INDICE=0.7277065

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX	TYPE		PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
G06	DESAV	1577	139	15.4	76	1462	138	16.1	70	115	142	12.0	160	1	UN	151	14.6	174	13	-1.5	104
G06	DESAV	1577	139	15.4	76	1462	138	16.1	70	115	142	12.0	160	2	HG	162	23.1	233	24	7.1	163
G06	DESAV	1577	139	15.4	76	1462	138	16.1	70	115	142	12.0	160	3	MB	134	8.3	195	-4	-7.8	125
G06	DESAV	1577	139	15.4	76	1462	138	16.1	70	115	142	12.0	160	4	BI	140	10.0	214	2	-6.0	144
G06	DESAV	1577	139	15.4	76	1462	138	16.1	70	115	142	12.0	160	5	TR	136	8.2	179	-2	-7.9	110
G06	DESAV	1577	139	15.4	76	1462	138	16.1	70	115	142	12.0	160	6	CR	137	8.6	168	-1	-7.4	99

7.83

PRODUCTIVITE, TAUX DU PROFIT, ET TAILLE MOYENS DES ENTREPRISES SELON LEURS TYPES D'ENGAGEMENT A L'EXPORTATION (PRODUITS MANUFACTURES, FRANCE-CEE, 1984)

INDICE 0.786713

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX	TYPE		PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
C03	DESAV	1894	193	17.6	101	1670	188	15.7	89	224	209	23.6	194	1	UN	239	29.2	336	50	13.6	247
C03	DESAV	1894	193	17.6	101	1670	188	15.7	89	224	209	23.6	194	2	HG	213	24.9	206	25	9.2	117
C03	DESAV	1894	193	17.6	101	1670	188	15.7	89	224	209	23.6	194	3	MB	206	24.8	202	18	9.2	113
C03	DESAV	1894	193	17.6	101	1670	188	15.7	89	224	209	23.6	194	4	BI	198	20.4	210	9	4.7	122
C03	DESAV	1894	193	17.6	101	1670	188	15.7	89	224	209	23.6	194	5	TR	203	21.0	204	14	5.4	116
C03	DESAV	1894	193	17.6	101	1670	188	15.7	89	224	209	23.6	194	6	CR	200	20.7	197	12	5.0	108

INDICE=0.8179777

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX	TYPE		PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
G03	DESAV	1801	109	13.2	87	1623	103	10.8	84	178	151	24.0	116	1	UN	150	22.7	123	47	11.9	39
G03	DESAV	1801	109	13.2	87	1623	103	10.8	84	178	151	24.0	116	2	HG	159	25.1	116	56	14.3	32
G03	DESAV	1801	109	13.2	87	1623	103	10.8	84	178	151	24.0	116	3	MB	146	25.8	125	43	15.0	41
G03	DESAV	1801	109	13.2	87	1623	103	10.8	84	178	151	24.0	116	4	BI	138	19.4	127	35	8.6	43
G03	DESAV	1801	109	13.2	87	1623	103	10.8	84	178	151	24.0	116	5	TR	150	24.4	120	47	13.6	36
G03	DESAV	1801	109	13.2	87	1623	103	10.8	84	178	151	24.0	116	6	CR	145	22.6	118	42	11.8	34

INDICE=0.8228087

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX	TYPE		PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
B11	DESAV	747	205	26.1	119	677	212	27.4	104	70	179	20.5	267	1	UN	287	36.2	354	74	8.8	250
B11	DESAV	747	205	26.1	119	677	212	27.4	104	70	179	20.5	267	2	HG	205	20.6	305	-7	-6.8	201
B11	DESAV	747	205	26.1	119	677	212	27.4	104	70	179	20.5	267	3	MB	174	20.5	276	-39	-6.9	172
B11	DESAV	747	205	26.1	119	677	212	27.4	104	70	179	20.5	267	4	BI	144	15.5	346	-69	-11.9	242
B11	DESAV	747	205	26.1	119	677	212	27.4	104	70	179	20.5	267	5	TR	143	12.3	291	-69	-15.1	187
B11	DESAV	747	205	26.1	119	677	212	27.4	104	70	179	20.5	267	6	CR	144	13.9	287	-69	-13.5	183

7.84

PRODUCTIVITE, TAUX DU PROFIT, ET TAILLE MOYENS DES
ENTREPRISES SELON LEURS TYPES D'ENGAGEMENT A
L'EXPORTATION (PRODUITS MANUFACTURES, FRANCE-CEE, 1984)

INDICE=0.8357907

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX	TYPE		PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
B07	DESAV	3576	159	13.2	90	3241	157	12.9	77	335	165	14.0	218	1	UN	161	7.6	373	4	-5.3	296
B07	DESAV	3576	159	13.2	90	3241	157	12.9	77	335	165	14.0	218	2	HG	172	16.6	261	15	3.7	185
B07	DESAV	3576	159	13.2	90	3241	157	12.9	77	335	165	14.0	218	3	MB	160	13.0	235	3	0.1	158
B07	DESAV	3576	159	13.2	90	3241	157	12.9	77	335	165	14.0	218	4	BI	169	14.7	241	11	1.8	164
B07	DESAV	3576	159	13.2	90	3241	157	12.9	77	335	165	14.0	218	5	TR	166	15.7	233	8	2.8	156
B07	DESAV	3576	159	13.2	90	3241	157	12.9	77	335	165	14.0	218	6	CR	167	15.3	224	10	2.4	147

INDICE=0.8412424

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX	TYPE		PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
B06	DESAV	8	125	-27.4	994	5	128	-14.0	979	3	119	-50.6	1019	1	UN	132	-34.1	1463	4	-20.1	484
B06	DESAV	8	125	-27.4	994	5	128	-14.0	979	3	119	-50.6	1019	2	HG	30	-568.6	1463	-98	-554.6	484
B06	DESAV	8	125	-27.4	994	5	128	-14.0	979	3	119	-50.6	1019	3	MB	37	-441.7	1019	-92	-427.7	41
B06	DESAV	8	125	-27.4	994	5	128	-14.0	979	3	119	-50.6	1019	4	BI	147	-18.1	1019	19	-4.1	41
B06	DESAV	8	125	-27.4	994	5	128	-14.0	979	3	119	-50.6	1019	5	TR	88	-110.2	1019	-40	-96.2	41
B06	DESAV	8	125	-27.4	994	5	128	-14.0	979	3	119	-50.6	1019	6	CR	127	-40.0	1019	-1	-26.0	41

INDICE=0.8497132

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX	TYPE		PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
B04	DESAV	104	296	30.4	316	81	268	24.8	287	23	363	40.5	417	1	UN	438	50.8	567	170	26.0	280
B04	DESAV	104	296	30.4	316	81	268	24.8	287	23	363	40.5	417	2	HG	290	37.7	439	22	12.9	152
B04	DESAV	104	296	30.4	316	81	268	24.8	287	23	363	40.5	417	3	MB	306	33.5	453	37	8.7	166
B04	DESAV	104	296	30.4	316	81	268	24.8	287	23	363	40.5	417	4	BI	386	41.3	493	118	16.5	206
B04	DESAV	104	296	30.4	316	81	268	24.8	287	23	363	40.5	417	5	TR	393	42.2	466	125	17.4	179
B04	DESAV	104	296	30.4	316	81	268	24.8	287	23	363	40.5	417	6	CR	389	41.6	466	121	16.9	179

PRODUCTIVITE, TAUX DU PROFIT, ET TAILLE MOYENS DES ENTREPRISES SELON LEURS TYPES D'ENGAGEMENT A L'EXPORTATION (PRODUITS MANUFACTURES, FRANCE-CEE, 1984)

INDICE=0.8518731

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX		TYPE	PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
G08	NEUTR	105	163	24.8	111	90	148	20.2	85	15	191	31.7	265	1	UN	156	17.7	567	7	-2.4	481
G08	NEUTR	105	163	24.8	111	90	148	20.2	85	15	191	31.7	265	2	HG	178	31.3	322	29	11.1	236
G08	NEUTR	105	163	24.8	111	90	148	20.2	85	15	191	31.7	265	3	MB	197	33.1	280	48	12.9	194
G08	NEUTR	105	163	24.8	111	90	148	20.2	85	15	191	31.7	265	4	BI	226	42.3	355	78	22.1	270
G08	NEUTR	105	163	24.8	111	90	148	20.2	85	15	191	31.7	265	5	TR	178	24.2	278	30	4.0	192
G08	NEUTR	105	163	24.8	111	90	148	20.2	85	15	191	31.7	265	6	CR	197	32.2	278	48	12.0	192

INDICE=0.8526641

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX		TYPE	PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
C06	NEUTR	54	452	43.7	1035	43	264	22.2	266	11	500	46.6	4040	1	UN	261	24.1	8800	-3	1.8	8534
C06	NEUTR	54	452	43.7	1035	43	264	22.2	266	11	500	46.6	4040	2	HG	539	48.0	4441	275	25.7	4175
C06	NEUTR	54	452	43.7	1035	43	264	22.2	266	11	500	46.6	4040	3	MB	580	48.6	4441	316	26.3	4175
C06	NEUTR	54	452	43.7	1035	43	264	22.2	266	11	500	46.6	4040	4	BI	436	44.5	4932	172	22.3	4666
C06	NEUTR	54	452	43.7	1035	43	264	22.2	266	11	500	46.6	4040	5	TR	467	44.9	4442	203	22.7	4175
C06	NEUTR	54	452	43.7	1035	43	264	22.2	266	11	500	46.6	4040	6	CR	454	44.7	4040	189	22.5	3773

INDICE=0.872036

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX		TYPE	PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
D02	NEUTR	97	152	16.9	548	71	146	14.5	471	26	161	20.6	759	1	UN	159	20.2	921	13	5.7	450
D02	NEUTR	97	152	16.9	548	71	146	14.5	471	26	161	20.6	759	2	HG	176	23.3	879	30	8.8	409
D02	NEUTR	97	152	16.9	548	71	146	14.5	471	26	161	20.6	759	3	MB	154	19.1	787	8	4.7	316
D02	NEUTR	97	152	16.9	548	71	146	14.5	471	26	161	20.6	759	4	BI	169	25.6	759	22	11.1	288
D02	NEUTR	97	152	16.9	548	71	146	14.5	471	26	161	20.6	759	5	TR	154	16.8	759	8	2.3	288
D02	NEUTR	97	152	16.9	548	71	146	14.5	471	26	161	20.6	759	6	CR	159	20.0	759	13	5.5	288

PRODUCTIVITE, TAUX DU PROFIT, ET TAILLE MOYENS DES
ENTREPRISES SELON LEURS TYPES D'ENGAGEMENT A
L'EXPORTATION (PRODUITS MANUFACTURES, FRANCE-CEE, 1984)

INDICE=0.8725074

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX	TYPE		PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
G07	NEUTR	1681	212	17.6	88	1681	212	17.6	88	0	0	0.0	0	1	UN	.	.	.	.	.	.
G07	NEUTR	1681	212	17.6	88	1681	212	17.6	88	0	0	0.0	0	2	HG	.	.	.	.	.	.
G07	NEUTR	1681	212	17.6	88	1681	212	17.6	88	0	0	0.0	0	3	MB	.	.	.	.	.	.
G07	NEUTR	1681	212	17.6	88	1681	212	17.6	88	0	0	0.0	0	4	BI	.	.	.	.	.	.
G07	NEUTR	1681	212	17.6	88	1681	212	17.6	88	0	0	0.0	0	5	TR	.	.	.	.	.	.
G07	NEUTR	1681	212	17.6	88	1681	212	17.6	88	0	0	0.0	0	6	CR	.	.	.	.	.	.

INDICE=0.9044729

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX	TYPE		PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
C01	NEUTR	266	163	16.9	115	227	157	17.9	73	39	170	15.9	362	1	UN	180	24.0	866	23	6.1	794
C01	NEUTR	266	163	16.9	115	227	157	17.9	73	39	170	15.9	362	2	HG	223	38.2	431	66	20.3	358
C01	NEUTR	266	163	16.9	115	227	157	17.9	73	39	170	15.9	362	3	MB	182	25.8	397	25	8.0	324
C01	NEUTR	266	163	16.9	115	227	157	17.9	73	39	170	15.9	362	4	BI	159	6.9	383	2	-10.9	310
C01	NEUTR	266	163	16.9	115	227	157	17.9	73	39	170	15.9	362	5	TR	160	10.0	362	3	-7.8	290
C01	NEUTR	266	163	16.9	115	227	157	17.9	73	39	170	15.9	362	6	CR	159	8.6	362	2	-9.2	290

INDICE=0.9152062

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX	TYPE		PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
B05	NEUTR	195	369	42.5	432	94	336	42.2	269	101	383	42.6	584	1	UN	417	44.3	821	81	2.0	551
B05	NEUTR	195	369	42.5	432	94	336	42.2	269	101	383	42.6	584	2	HG	393	43.0	689	57	0.8	420
B05	NEUTR	195	369	42.5	432	94	336	42.2	269	101	383	42.6	584	3	MB	362	41.3	660	26	-0.9	390
B05	NEUTR	195	369	42.5	432	94	336	42.2	269	101	383	42.6	584	4	BI	400	44.5	651	64	2.2	381
B05	NEUTR	195	369	42.5	432	94	336	42.2	269	101	383	42.6	584	5	TR	366	40.8	627	30	-1.4	358
B05	NEUTR	195	369	42.5	432	94	336	42.2	269	101	383	42.6	584	6	CR	383	42.7	610	47	0.4	341

PRODUCTIVITE, TAUX DU PROFIT, ET TAILLE MOYENS DES ENTREPRISES SELON LEURS TYPES D'ENGAGEMENT A L'EXPORTATION (PRODUITS MANUFACTURES, FRANCE-CEE, 1984)

INDICE-0.9169379

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX	TYPE		PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
F02	NEUTR	82	307	32.7	1394	69	310	32.9	1567	13	252	27.0	478	1	UN	290	33.9	609	-21	1.0	-957
F02	NEUTR	82	307	32.7	1394	69	310	32.9	1567	13	252	27.0	478	2	HG	238	26.4	478	-72	-6.6	-1089
F02	NEUTR	82	307	32.7	1394	69	310	32.9	1567	13	252	27.0	478	3	MB	255	25.4	508	-55	-7.5	-1058
F02	NEUTR	82	307	32.7	1394	69	310	32.9	1567	13	252	27.0	478	4	BI	249	25.6	508	-61	-7.3	-1058
F02	NEUTR	82	307	32.7	1394	69	310	32.9	1567	13	252	27.0	478	5	TR	236	21.9	508	-74	-11.1	-1058
F02	NEUTR	82	307	32.7	1394	69	310	32.9	1567	13	252	27.0	478	6	CR	240	23.1	508	-70	-9.9	-1058

INDICE=0.9315303

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX	TYPE		PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
C05	NEUTR	444	174	18.3	131	340	162	12.4	89	104	187	23.8	271	1	UN	182	23.9	439	20	11.5	350
C05	NEUTR	444	174	18.3	131	340	162	12.4	89	104	187	23.8	271	2	HG	186	26.2	288	24	13.8	199
C05	NEUTR	444	174	18.3	131	340	162	12.4	89	104	187	23.8	271	3	MB	181	24.0	292	19	11.6	203
C05	NEUTR	444	174	18.3	131	340	162	12.4	89	104	187	23.8	271	4	BI	196	21.1	315	34	8.7	226
C05	NEUTR	444	174	18.3	131	340	162	12.4	89	104	187	23.8	271	5	TR	189	24.5	293	28	12.1	204
C05	NEUTR	444	174	18.3	131	340	162	12.4	89	104	187	23.8	271	6	CR	193	22.7	285	31	10.3	196

INDICE=0.9450799

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX	TYPE		PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
RES	NEUTR	478	169	19.5	80	423	169	19.6	70	55	169	18.9	157	1	UN	171	14.7	216	1	-4.9	146
RES	NEUTR	478	169	19.5	80	423	169	19.6	70	55	169	18.9	157	2	HG	175	22.1	164	6	2.5	94
RES	NEUTR	478	169	19.5	80	423	169	19.6	70	55	169	18.9	157	3	MB	151	17.3	189	-18	-2.4	119
RES	NEUTR	478	169	19.5	80	423	169	19.6	70	55	169	18.9	157	4	BI	177	20.8	192	7	1.1	123
RES	NEUTR	478	169	19.5	80	423	169	19.6	70	55	169	18.9	157	5	TR	157	17.3	174	-12	-2.4	104
RES	NEUTR	478	169	19.5	80	423	169	19.6	70	55	169	18.9	157	6	CR	167	19.1	164	-2	-0.5	94

7.88

PRODUCTIVITE, TAUX DU PROFIT, ET TAILLE MOYENS DES
ENTREPRISES SELON LEURS TYPES D'ENGAGEMENT A
L'EXPORTATION (PRODUITS MANUFACTURES, FRANCE-CEE, 1984)

INDICE=0.9540851

NIV4O	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX	TYPE		PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
G02	NEUTR	1725	142	21.6	133	1298	135	21.1	91	427	150	22.1	260	1	UN	158	26.4	318	23	5.3	227
G02	NEUTR	1725	142	21.6	133	1298	135	21.1	91	427	150	22.1	260	2	HG	147	21.9	294	12	0.7	203
G02	NEUTR	1725	142	21.6	133	1298	135	21.1	91	427	150	22.1	260	3	MB	140	15.7	285	5	-5.4	194
G02	NEUTR	1725	142	21.6	133	1298	135	21.1	91	427	150	22.1	260	4	BI	152	23.4	284	17	2.2	193
G02	NEUTR	1725	142	21.6	133	1298	135	21.1	91	427	150	22.1	260	5	TR	153	23.0	287	18	1.8	196
G02	NEUTR	1725	142	21.6	133	1298	135	21.1	91	427	150	22.1	260	6	CR	152	23.1	271	17	2.0	180

INDICE=0.9552406

NIV4O	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX	TYPE		PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
A02	NEUTR	438	199	28.7	52	401	201	28.5	48	37	188	29.9	91	1	UN	193	31.4	100	-8	2.9	51
A02	NEUTR	438	199	28.7	52	401	201	28.5	48	37	188	29.9	91	2	HG	203	31.2	108	2	2.7	60
A02	NEUTR	438	199	28.7	52	401	201	28.5	48	37	188	29.9	91	3	MB	183	30.9	96	-18	2.4	48
A02	NEUTR	438	199	28.7	52	401	201	28.5	48	37	188	29.9	91	4	BI	143	17.8	121	-58	-10.7	73
A02	NEUTR	438	199	28.7	52	401	201	28.5	48	37	188	29.9	91	5	TR	160	23.1	116	-42	-5.4	68
A02	NEUTR	438	199	28.7	52	401	201	28.5	48	37	188	29.9	91	6	CR	151	20.2	105	-51	-8.2	57

INDICE=1.056537

NIV4O	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX	TYPE		PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
C04	NEUTR	390	176	9.9	148	321	171	8.4	111	69	185	12.0	323	1	UN	167	6.5	574	-4	-1.9	463
C04	NEUTR	390	176	9.9	148	321	171	8.4	111	69	185	12.0	323	2	HG	189	11.9	354	18	3.4	243
C04	NEUTR	390	176	9.9	148	321	171	8.4	111	69	185	12.0	323	3	MB	220	26.3	327	49	17.9	216
C04	NEUTR	390	176	9.9	148	321	171	8.4	111	69	185	12.0	323	4	BI	180	6.4	349	9	-2.0	238
C04	NEUTR	390	176	9.9	148	321	171	8.4	111	69	185	12.0	323	5	TR	175	7.5	327	4	-1.0	217
C04	NEUTR	390	176	9.9	148	321	171	8.4	111	69	185	12.0	323	6	CR	177	7.0	323	6	-1.4	212

PRODUCTIVITE, TAUX DU PROFIT, ET TAILLE MOYENS DES ENTREPRISES SELON LEURS TYPES D'ENGAGEMENT A L'EXPORTATION (PRODUITS MANUFACTURES, FRANCE-CEE, 1984)

INDICE=1.078836

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX		TYPE	PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
C08	NEUTR	834	215	21.0	265	721	215	19.8	234	113	215	24.9	458	1	UN	309	26.1	951	94	6.3	717
C08	NEUTR	834	215	21.0	265	721	215	19.8	234	113	215	24.9	458	2	HG	215	25.4	489	-0	5.6	255
C08	NEUTR	834	215	21.0	265	721	215	19.8	234	113	215	24.9	458	3	MB	221	25.1	482	6	5.3	247
C08	NEUTR	834	215	21.0	265	721	215	19.8	234	113	215	24.9	458	4	BI	200	24.2	502	-15	4.4	267
C08	NEUTR	834	215	21.0	265	721	215	19.8	234	113	215	24.9	458	5	TR	212	24.2	468	-3	4.4	233
C08	NEUTR	834	215	21.0	265	721	215	19.8	234	113	215	24.9	458	6	CR	206	24.2	456	-9	4.4	221

INDICE=1.144653

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX		TYPE	PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
E01	NEUTR	639	166	8.4	682	513	158	9.6	311	126	170	7.8	2190	1	UN	145	-14.0	4574	-14	-23.6	4262
E01	NEUTR	639	166	8.4	682	513	158	9.6	311	126	170	7.8	2190	2	HG	173	9.3	2587	15	-0.2	2275
E01	NEUTR	639	166	8.4	682	513	158	9.6	311	126	170	7.8	2190	3	MB	159	1.1	2562	1	-8.4	2250
E01	NEUTR	639	166	8.4	682	513	158	9.6	311	126	170	7.8	2190	4	BI	174	11.2	2426	16	1.7	2115
E01	NEUTR	639	166	8.4	682	513	158	9.6	311	126	170	7.8	2190	5	TR	174	9.9	2240	16	0.4	1929
E01	NEUTR	639	166	8.4	682	513	158	9.6	311	126	170	7.8	2190	6	CR	174	10.5	2190	16	1.0	1878

INDICE=1.151749

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX		TYPE	PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
C07	AVANT	699	183	16.3	290	620	185	15.5	257	79	179	19.2	545	1	UN	170	19.9	1052	-14	4.4	795
C07	AVANT	699	183	16.3	290	620	185	15.5	257	79	179	19.2	545	2	HG	169	18.8	574	-16	3.3	317
C07	AVANT	699	183	16.3	290	620	185	15.5	257	79	179	19.2	545	3	MB	180	19.6	593	-5	4.0	336
C07	AVANT	699	183	16.3	290	620	185	15.5	257	79	179	19.2	545	4	BI	180	19.6	559	-5	4.1	302
C07	AVANT	699	183	16.3	290	620	185	15.5	257	79	179	19.2	545	5	TR	183	18.7	559	-1	3.2	302
C07	AVANT	699	183	16.3	290	620	185	15.5	257	79	179	19.2	545	6	CR	182	19.0	552	-3	3.5	295

7.90

PRODUCTIVITE, TAUX DU PROFIT, ET TAILLE MOYENS DES
ENTREPRISES SELON LEURS TYPES D'ENGAGEMENT A
L'EXPORTATION (PRODUITS MANUFACTURES, FRANCE-CEE, 1984)

INDICE=1.221704

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX		TYPE	PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
G01	AVANT	774	247	26.2	232	639	235	22.9	181	135	270	31.6	472	1	UN	285	33.8	717	50	10.9	536
G01	AVANT	774	247	26.2	232	639	235	22.9	181	135	270	31.6	472	2	HG	267	29.5	483	32	6.6	302
G01	AVANT	774	247	26.2	232	639	235	22.9	181	135	270	31.6	472	3	MB	262	31.3	481	27	8.4	300
G01	AVANT	774	247	26.2	232	639	235	22.9	181	135	270	31.6	472	4	BI	265	32.3	517	30	9.4	336
G01	AVANT	774	247	26.2	232	639	235	22.9	181	135	270	31.6	472	5	TR	276	32.4	479	41	9.5	298
G01	AVANT	774	247	26.2	232	639	235	22.9	181	135	270	31.6	472	6	CR	271	32.3	473	36	9.5	292

INDICE=1.228974

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX		TYPE	PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
B08	AVANT	602	207	25.9	163	518	187	23.6	124	84	245	29.2	400	1	UN	306	40.5	618	119	16.9	493
B08	AVANT	602	207	25.9	163	518	187	23.6	124	84	245	29.2	400	2	HG	214	17.7	430	26	-5.9	306
B08	AVANT	602	207	25.9	163	518	187	23.6	124	84	245	29.2	400	3	MB	224	24.9	411	37	1.3	287
B08	AVANT	602	207	25.9	163	518	187	23.6	124	84	245	29.2	400	4	BI	228	24.5	427	41	0.9	303
B08	AVANT	602	207	25.9	163	518	187	23.6	124	84	245	29.2	400	5	TR	275	35.7	414	88	12.1	290
B08	AVANT	602	207	25.9	163	518	187	23.6	124	84	245	29.2	400	6	CR	248	29.8	412	61	6.2	288

INDICE=1.273534

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX		TYPE	PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
B01	AVANT	183	171	-0.8	783	132	188	4.2	488	51	158	-5.6	1546	1	UN	160	4.0	2034	-28	-0.2	1545
B01	AVANT	183	171	-0.8	783	132	188	4.2	488	51	158	-5.6	1546	2	HG	164	6.4	1903	-23	2.2	1415
B01	AVANT	183	171	-0.8	783	132	188	4.2	488	51	158	-5.6	1546	3	MB	156	-8.7	1665	-31	-12.9	1176
B01	AVANT	183	171	-0.8	783	132	188	4.2	488	51	158	-5.6	1546	4	BI	159	-9.3	1599	-29	-13.5	1110
B01	AVANT	183	171	-0.8	783	132	188	4.2	488	51	158	-5.6	1546	5	TR	154	-3.1	1632	-34	-7.3	1143
B01	AVANT	183	171	-0.8	783	132	188	4.2	488	51	158	-5.6	1546	6	CR	157	-7.0	1599	-31	-11.2	1110

PRODUCTIVITE, TAUX DU PROFIT, ET TAILLE MOYENS DES ENTREPRISES SELON LEURS TYPES D'ENGAGEMENT A L'EXPORTATION (PRODUITS MANUFACTURES, FRANCE-CEE, 1984)

INDICE=1.319057

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX	TYPE		PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
B02	AVANT	108	334	44.2	526	54	365	43.3	284	54	322	44.6	768	1	UN	237	25.8	1008	-129	-17.5	724
B02	AVANT	108	334	44.2	526	54	365	43.3	284	54	322	44.6	768	2	HG	234	25.0	968	-132	-18.2	684
B02	AVANT	108	334	44.2	526	54	365	43.3	284	54	322	44.6	768	3	MB	269	34.6	885	-96	-8.7	601
B02	AVANT	108	334	44.2	526	54	365	43.3	284	54	322	44.6	768	4	BI	287	36.7	780	-79	-6.6	496
B02	AVANT	108	334	44.2	526	54	365	43.3	284	54	322	44.6	768	5	TR	484	63.4	828	119	20.2	544
B02	AVANT	108	334	44.2	526	54	365	43.3	284	54	322	44.6	768	6	CR	364	50.6	784	-1	7.4	499

INDICE=1.431688

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX	TYPE		PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
B03	AVANT	148	207	22.5	377	108	213	20.8	222	40	203	23.8	793	1	UN	207	26.4	1019	-6	5.6	797
B03	AVANT	148	207	22.5	377	108	213	20.8	222	40	203	23.8	793	2	HG	198	23.6	832	-15	2.8	609
B03	AVANT	148	207	22.5	377	108	213	20.8	222	40	203	23.8	793	3	MB	192	22.5	856	-21	1.7	634
B03	AVANT	148	207	22.5	377	108	213	20.8	222	40	203	23.8	793	4	BI	215	21.9	961	2	1.1	738
B03	AVANT	148	207	22.5	377	108	213	20.8	222	40	203	23.8	793	5	TR	207	23.9	874	-6	3.1	651
B03	AVANT	148	207	22.5	377	108	213	20.8	222	40	203	23.8	793	6	CR	210	23.0	853	-3	2.2	631

INDICE=1.483564

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX	TYPE		PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
G09	AVANT	88	168	26.8	101	60	149	22.4	71	28	186	30.0	164	1	UN	192	34.7	218	43	12.3	146
G09	AVANT	88	168	26.8	101	60	149	22.4	71	28	186	30.0	164	2	HG	208	31.3	169	59	8.9	97
G09	AVANT	88	168	26.8	101	60	149	22.4	71	28	186	30.0	164	3	MB	168	18.4	200	19	-4.0	129
G09	AVANT	88	168	26.8	101	60	149	22.4	71	28	186	30.0	164	4	BI	180	29.7	179	31	7.3	108
G09	AVANT	88	168	26.8	101	60	149	22.4	71	28	186	30.0	164	5	TR	153	19.9	167	4	-2.5	96
G09	AVANT	88	168	26.8	101	60	149	22.4	71	28	186	30.0	164	6	CR	161	23.2	167	12	0.8	96

PRODUCTIVITE, TAUX DU PROFIT, ET TAILLE MOYENS DES ENTREPRISES SELON LEURS TYPES D'ENGAGEMENT A L'EXPORTATION (PRODUITS MANUFACTURES, FRANCE-CEE, 1984)

INDICE=1.57042

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX		TYPE	PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
B09	AVANT	166	157	10.2	536	122	122	-2.9	147	44	166	12.6	1614	1	UN	156	11.3	2953	33	14.2	2806
B09	AVANT	166	157	10.2	536	122	122	-2.9	147	44	166	12.6	1614	2	HG	168	14.1	1767	46	17.0	1620
B09	AVANT	166	157	10.2	536	122	122	-2.9	147	44	166	12.6	1614	3	MB	165	13.5	1725	43	16.4	1578
B09	AVANT	166	157	10.2	536	122	122	-2.9	147	44	166	12.6	1614	4	BI	166	11.9	1767	44	14.8	1620
B09	AVANT	166	157	10.2	536	122	122	-2.9	147	44	166	12.6	1614	5	TR	166	13.6	1688	44	16.5	1542
B09	AVANT	166	157	10.2	536	122	122	-2.9	147	44	166	12.6	1614	6	CR	166	12.4	1614	44	15.3	1467

INDICE=2.155491

NIV40	CLASS	SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX		TYPE	PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
G10	AVANT	60	147	22.4	109	42	131	19.1	57	18	157	24.0	230	1	UN	158	24.4	341	27	5.2	284
G10	AVANT	60	147	22.4	109	42	131	19.1	57	18	157	24.0	230	2	HG	154	24.8	255	23	5.7	198
G10	AVANT	60	147	22.4	109	42	131	19.1	57	18	157	24.0	230	3	MB	152	23.7	230	22	4.5	173
G10	AVANT	60	147	22.4	109	42	131	19.1	57	18	157	24.0	230	4	BI	147	15.8	260	17	-3.3	204
G10	AVANT	60	147	22.4	109	42	131	19.1	57	18	157	24.0	230	5	TR	166	25.3	255	35	6.2	198
G10	AVANT	60	147	22.4	109	42	131	19.1	57	18	157	24.0	230	6	CR	160	22.6	242	29	3.4	185

PRODUCTIVITE, TAUX DU PROFIT, ET TAILLE MOYENS DES
ENTREPRISES SELON LEURS TYPES D'ENGAGEMENT A
L'EXPORTATION (PRODUITS MANUFACTURES, FRANCE-CEE, 1984)

CLASS=1 DES

SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX	TYPE		PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
12018	162	16.3	101	10695	157	15.0	89	1323	180	20.6	199	1	UN	196	23.6	292	39	8.6	202
12018	162	16.3	101	10695	157	15.0	89	1323	180	20.6	199	2	HG	182	23.3	230	25	8.3	141
12018	162	16.3	101	10695	157	15.0	89	1323	180	20.6	199	3	MB	175	19.7	215	18	4.7	126
12018	162	16.3	101	10695	157	15.0	89	1323	180	20.6	199	4	BI	185	20.2	231	28	5.3	142
12018	162	16.3	101	10695	157	15.0	89	1323	180	20.6	199	5	TR	172	18.7	213	15	3.7	124
12018	162	16.3	101	10695	157	15.0	89	1323	180	20.6	199	6	CR	178	19.4	206	21	4.4	117

CLASS=2 NEU

SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX	TYPE		PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
7428	206	22.5	210	6292	200	21.0	145	1136	214	24.5	571	1	UN	189	21.9	856	-11	0.9	711
7428	206	22.5	210	6292	200	21.0	145	1136	214	24.5	571	2	HG	260	32.8	649	60	11.7	504
7428	206	22.5	210	6292	200	21.0	145	1136	214	24.5	571	3	MB	191	18.4	633	-9	-2.6	488
7428	206	22.5	210	6292	200	21.0	145	1136	214	24.5	571	4	BI	212	24.0	647	12	3.0	502
7428	206	22.5	210	6292	200	21.0	145	1136	214	24.5	571	5	TR	210	22.6	618	10	1.6	472
7428	206	22.5	210	6292	200	21.0	145	1136	214	24.5	571	6	CR	211	23.3	592	11	2.2	447

CLASS=3 AVA

SNT	SPRODT	SPROFT	STAILT	SNN	SPRODN	SPROFN	STAILN	SNX	SPRODX	SPROFX	STAILX	TYPE		PRODI	PROFI	TAILLEI	ECARTP	ECARTF	ECARTT
2828	206	20.6	297	2295	202	18.8	204	533	211	22.9	698	1	UN	219	26.4	1106	17	7.6	902
2828	206	20.6	297	2295	202	18.8	204	533	211	22.9	698	2	HG	216	23.8	759	14	5.0	555
2828	206	20.6	297	2295	202	18.8	204	533	211	22.9	698	3	MB	200	18.6	750	-2	-0.2	546
2828	206	20.6	297	2295	202	18.8	204	533	211	22.9	698	4	BI	198	17.4	757	-4	-1.4	553
2828	206	20.6	297	2295	202	18.8	204	533	211	22.9	698	5	TR	234	31.0	728	31	12.2	524
2828	206	20.6	297	2295	202	18.8	204	533	211	22.9	698	6	CR	213	23.7	713	11	4.9	509

CHAPTER 8

Partial Equilibrium Calculations of the Impact of
Internal Market Barriers in the European Community

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The authors wish to thank Jim McKenna for programming assistance and Christian Dewaleyne for the Community input-output calculations. Thanks also to colleagues in DG II and to John Whalley and Alan Winters for helpful comments, the authors remain responsible for any errors.

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Contents

Introduction

This paper attempts to quantify the economic costs of the existing barriers to intra-EC trade and commerce, or conversely, the potential benefits from what has come to be known as "internal market completion".[1] Current barriers are many and various, some sectoral, others horizontal, some applying specifically to trade others to production or provision of goods and services in general.

The reduction or removal of barriers can be expected to lead to a number of important effects. Differences between prices in different regions will be reduced with the concurrent static[2] benefits of improved allocative efficiency and lower consumer prices. In addition greater market integration and increased competition will be fostered, with the associated dynamic[2] benefits of reduced X-inefficiency (increased technical efficiency), erosion of oligopoly profits and improved consumer choice. Furthermore, it is generally accepted that innovation would be encouraged, both in terms of technical progress and the development of new products and services. This latter feature can be thought of as a genuinely dynamic effect and one which is consequently the most difficult to quantify.

Few attempts have been made by economists to estimate the dynamic effects of trade barriers, see for example Balassa (1974). Such a task is even more difficult in the present case because the widespread changes envisaged are likely to entail substantial reorganisation and specialisation right across the Community economy and over a lengthy period. Detailed estimates of the potential benefits of both barrier removal and market integration effects are given in 'The Economics of 1992' report (1988) but the integration effects are obtained by estimating the economies of scale effects from restructuring and by extending the potential benefits obtained in this paper using the results of Smith and Venables (1987). For a full exposition of the calculation of these market integration effects, the interested reader is referred both to the relevant sections of the report, to the paper cited and to chapter 9 of this volume.

This paper, therefore, concentrates on the static or barrier removal effects, and is ordered as follows. Section 1 examines the most significant barriers to current intra-EC trade and considers the relative

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merits of possible approaches to quantifying them, in particular partial and general equilibrium analysis. The second section presents the details of the partial equilibrium approach which is adopted and examines closely the potential biases or omissions. The third section covers the rather extensive data requirements whilst the fourth presents and examines the results. A fifth section concludes.

Section 1: Internal Market Barriers

The barriers to intra-EC trade which are mentioned in the White Paper may be classified as either cost increasing barriers or restrictions on market entry, and this is the focus of the paper. But it is important to recognise that the present internal market is characterised by a number of other market imperfections. Examples include quantitative restrictions or quotas in certain sectors (this has applied both to Community production eg steel and to country-specific imports eg automobiles), price support mechanisms in agriculture and a range of subsidy measures at both Community and national level, albeit with varying degrees of economic justification.

One of the most observable cost increasing barriers in the Community is that due to customs procedures[3]. These formalities, which involve actual delays and various kinds of administrative procedure, impose a cost on the movement of all goods between member countries, a cost which varies according to the goods and countries concerned.

A further cost is imposed by norms and technical standards which vary between countries. These require producers to manufacture or package goods in forms which are different for other EC markets than those for their own domestic market.

Both of these elements can be thought of as cost-increasing non-tariff barriers which create a wedge between the cost of domestic goods and delivered exports, considerably greater than the transport cost involved. In some cases, however, regulations or standards impose extra costs on local production as well as on imports. One example is the processed food industry where national regulations on inputs, testing and packaging not only restrict trade but increase production costs, often unnecessarily.

Another important barrier is the restriction of market entry which ultimately imposes a cost on the consumer by limiting choice, inhibiting competition among sellers or curtailing the exploitation of economies of scale. In some instances the barrier is total, in that trade does not exist at all. This is often the case with public procurement restrictions.

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Moreover, the cost here is not simply that governments or public authorities are prevented from purchasing goods or services from cheaper or the cheapest sources. Market segmentation allows relatively inefficient enterprises to survive, in some cases with considerable local market power, and prevents the move towards more efficient market structures which would be the consequence of an increase in competition. It, therefore, follows that such rationalisation effects are likely to be of considerable importance in sectors where trade and European-wide competition have been prohibited to date. Noteable examples are telecommunications equipment, power generating equipment and railway rolling stock.

In many other sectors market access is not total but limited, either by quotas, regulations, restrictions on establishment, or by capital controls. This is particularly true for a number of service sectors eg banking, insurance and business services, and air and freight transport.

One possible approach, therefore, to quantifying the potential benefits of internal market completion is to estimate separately the cost of each of the barriers observed. The major drawback here is the extent to which the barriers mentioned overlap and interact, making it difficult to avoid double-counting and at the same time account for all the potential effects.

A much more satisfactory approach would be to use a general equilibrium model that was rich enough, not only to encompass spillover effects between sectors (substitution and income effects) and between countries (trade effects conditioned by some kind of trade balance restriction) but to consider the benefits of increased integration and competition in markets which are characterised by imperfections. Unfortunately, no such tool is available.

The solution adopted, therefore has been to employ partial equilibrium techniques, where the price or cost effects are treated in a consistent fashion but on a sector by sector basis. Partial equilibrium methods have typically been used[4] to examine the static effects of tariff barriers both on importing and exporting countries. The great advantage is their simplicity of application and the fact that, when markets can be

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characterised by perfect competition and price effects are relatively small, they approximate the general equilibrium calculations.

What they miss in comparison to general equilibrium calculations are the interactive effects between sectors which occur as relative prices and relative factor payments change. However, these biases are not expected to be particularly large for what are relatively small cost changes spread across many sectors.

The main drawback of the traditional partial equilibrium analysis[5] in the context of the present problem is shared by the traditional general equilibrium approach. These disadvantages derive from the relatively restrictive assumptions behind the analysis, namely those associated with perfectly competitive markets. This makes traditional partial equilibrium methods rather unsatisfactory for dealing with potential gains from increased competition in markets characterised by imperfections, unless such market structure is specifically modelled. Reductions in X-inefficiency can be represented by the rightward or downward shift of sectoral supply curves but large economies of scale effects are not easily incorporated into a conceptual approach which essentially assumes them away.

Furthermore, benefits and losses in the partial equilibrium framework are expressed in terms of welfare changes for consumers, producers and governments. There is, therefore, no immediate provision for examining adjustment costs as factors move from shrinking to expanding sectors, although these could be incorporated by subtracting the present value of the welfare costs of adjustment (occurring once and probably spread over the first few years) from the present value of the total welfare benefits of permanent market integration.

Despite these drawbacks, the use of partial equilibrium methods can be defended for reasons of transparency and simplicity. It is also important to note that the static welfare gains from internal market liberalisation are of a much greater order of magnitude than would be the case for tariff removal or customs union formation, even though the notion of trade diversion can not be ignored. This is because the benefits derived from the lower cost of imports are not offset by a loss of tariff revenue. It

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is the welfare gain of the relevant rectangles which is more important than that of the traditional triangles (see section 2 for further details).

Two implications can therefore be drawn. A first order of magnitude of the static economic gains can be derived on a sectoral basis by multiplying cost reductions by the existing level of imports (for a trade barrier) or by the existing level of output (for a regulation which imposes costs on production). This means that total welfare benefits are much less subject to assumptions on supply and demand elasticities than would normally be the case.

For a number of reasons which are detailed in the following sections, it is suggested that the estimates produced in this paper do not have any obvious net bias. Nevertheless, a margin of error should be attached to the figures and this is emphasised by the presentation of a range of results.

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Section 2: Method

The removal of the trade and regulatory barriers mentioned in section 1 and the consequent cost reductions of traded goods and production leads to a number of effects.

In the first case the usual trade creation and trade diversion effects occur. Cheaper imports from other Community countries will to varying degrees be substituted for locally produced goods. Consumption and trade within the EC will rise and allocative efficiency will improve. At the same time there will be a tendency for imports from countries outside the Community to be reduced, except to the extent that external exporters can also take advantage of standardised norms or cheaper distribution within the EC.

In the second case reduced regulatory activity may lower production costs directly and, indirectly, by inducing greater market integration and competition. An example in the financial services sector will serve. Alleviating the restrictions governing establishment or exchange controls will in general lower costs of banking and insurance services and, to the extent that there is competition, prices will fall thereby increasing consumer surplus without eroding producer surplus. But greater market access will encourage further competition at a European level. The consequent reorganisation, exploitation of economies of scale, specialisation and improved technical efficiency will lead to additional cost and price reductions. However to the extent that prices are pushed nearer to costs, there will be a redistribution of welfare from producers to consumers. This reduction of producer surplus has to be subtracted from gains in consumer welfare.

At the same time, any cost reductions achieved within the Community will improve its trading position with the rest of the world.

The methods used to encompass these various effects are treated in the rest of this section. Stage one treats the effects produced by lower trade barriers within the Community. It confines itself to final demand, including investment goods. Stage two concentrates on the effects due to lower production cost. In order to treat both intermediate and final goods the partial equilibrium calculations are performed in conjunction with Community input-output tables. Any other cost effects on intermediate goods (either trade or economies of scale effects) are also treated here. Finally stage three treats scale effects on final goods only, although the results of scale effects on intermediate goods are also reported as part of stage three. In the essentially static treatment in this paper, scale effects encompass no more than those which derive from spreading greater output over existing plant.

The three stages should be seen, therefore, more as practical accounting steps rather than clear conceptual divisions, and the remainder of the section indicates more clearly exactly what is included and where.

2.1 Stage 1, Trade Barriers

The first stage operates in the usual three country framework with a single Community country importing both from the rest of the Community and from the rest of the world. To illustrate the salient features, the simpler two-country case is first considered.

Figure 1

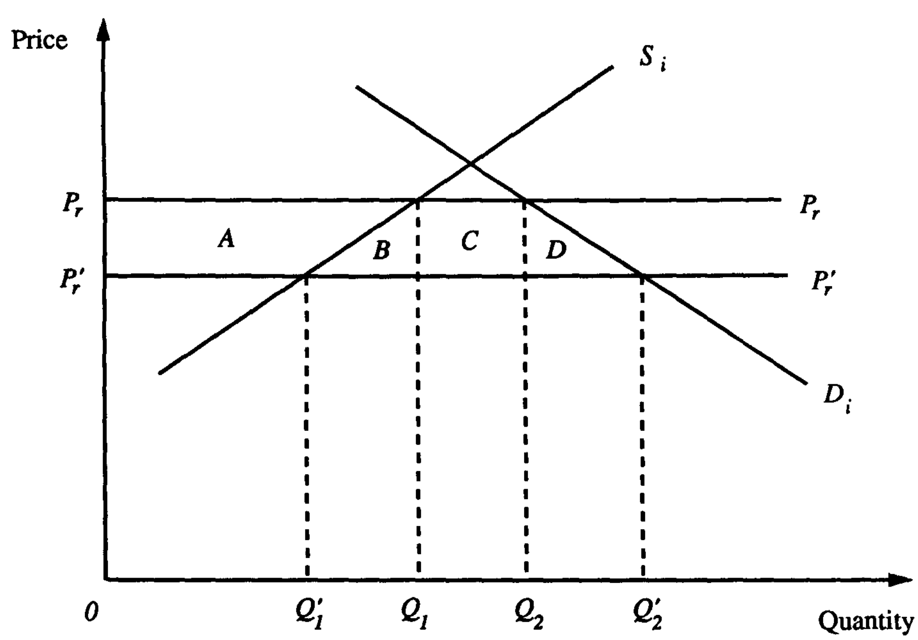

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Figure 1 is drawn for a single good, with D_i and S_i respectively representing the domestic or home country demand and supply schedules. The world price is P_r' and P_r represents the import supply schedule if the importing country I imposes a tariff equal to $t = (P_r - P_r')/P_r'$. Alternatively, the difference may represent an equivalent non-tariff barrier where t represents a mark-up which consumers or importers in the home country face due to the extra costs imposed by the barriers. Under free trade the country would import $Q_1'Q_2'$ and produce OQ_1' domestically. In the presence of the barrier, trade is lower at Q_1Q_2 and consumption declines to OQ_2.

The barrier therefore has a trade effect, a production effect and a consumption effect. In the case of a tariff, it also has a revenue effect in that amount C (equals t times Q_1Q_2) accrues to the government in country I in the form of tariff receipts. The relative size of these effects for a given barrier depends on the elasticity of demand for imports which in turn depends on the elasticities of supply and demand for output. Thus the adverse effects of the barrier are less for inelastic goods than for more elastic goods because the distortion of quantities is smaller.

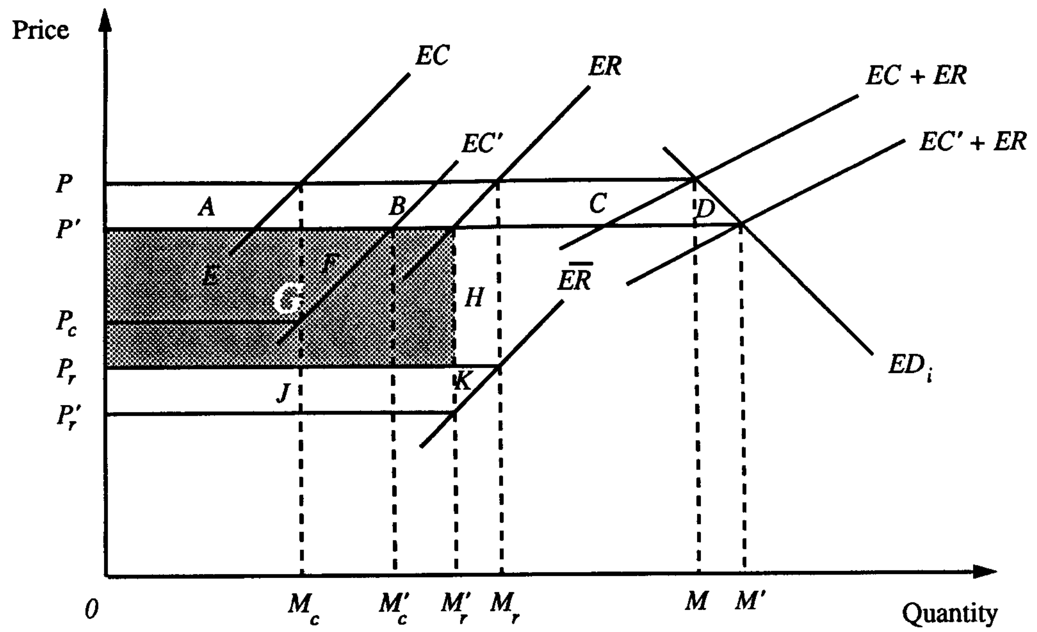
When the non-tariff barrier is lifted, consumer surplus increases by area (A+B+C+D) while there is a loss in producer surplus of A. The net welfare gain, therefore, is represented by area (B+C+D). For the elimination of an equivalent tariff barrier, the net welfare gain would only be area (B+D) due to the loss of tariff revenue.

The approach used in this paper elaborates on this model in two important ways. Firstly it assumes that the importing country faces a supply curve which is not perfectly elastic so that an increased demand for imports increases their price. Secondly, it assumes that goods (or services) may be imported both from other Community countries and from the rest of the world. Figure 2 represents this situation.

It is assumed in figure 2 that non-tariff barriers between I and C disappear while the tariff (inclusive of any non-tariff barrier effects) against the rest of the world (in effect the Common External Tariff or CET) remains constant.

.../...

Figure 2



Note : $OM_c + OM_r = OM$
$OM'_c + OM'_r = OM'$

ED_i represents the excess demand schedule for the good in country I. EC and EC' are the excess supply schedules of C before and after non-tariff barriers are removed. ER and $\overline{ER}$ represent the excess supply schedules of R, inclusive and net of the CET respectively, ie I faces an import supply schedule from R of ER while producers in R receive revenue according to $\overline{ER}$. The import supply schedule faced by I shifts from (EC+ER) to (EC'+ER) when internal barriers are removed. These schedules intersect ED_i at prices P and P' respectively, so that the elimination of barriers leads to a reduction in price in country I. The amount of the price fall depends on the cost equivalent of the barrier (downward shift of EC), the excess demand elasticity in country I and the excess supply elasticities of C and R. The price received by exporters in C, net of costs associated with the barriers rises from P_c to P' while the price net of tariffs received by exporters in R falls from P_r to P_r'.

When internal barriers are removed, I's total imports rise from M to M', with imports from C rising from M_c to M_c' and from R falling from M_r to M_r'. The reduction in imports from the rest of the world, by analogy with customs union theory may be called trade diversion since it represents a shift from a lower cost producer outside the Community to a higher cost producer within.

The static welfare effects on country I are: a consumer surplus gain (net of producer surplus loss) of (A+B+C+D); a loss of tariff revenue of (A+B+G+H) - (G+J). The net gain to I is given by areas (C+D-H+J). These areas may be interpreted as gains or losses from terms of trade changes. Area C equals the terms of trade gain on existing imports from C, while D gives the gain on additional imports from C. Area H represents the terms of trade loss on imports diverted from the lower cost producer R to C, while area J is the terms of trade gain from the reduced price paid on remaining imports from R.

The welfare effect on the rest of the Community C consists of the producer surplus gain (net of consumer surplus loss) of areas (E+F). E equals the terms of trade gain on existing exports to I while F is the producer surplus gain on additional exports.

The rest of the world is characterised by a loss of producer surplus equal to (J+K).

Given estimates of the supply and demand elasticities, the reduction in the non-tariff barrier and the existing trade shares, all these welfare changes can be calculated as proportions of total existing imports.

Where the barriers being removed are technical norms specific to the importer, it may be expected that exporters in the rest of the world will also benefit from market integration in that their costs of producing varying specifications for different Community countries will be reduced. This feature may also be incorporated by shifting downwards the excess supply curve of the rest of the world by an amount reflecting this cost saving. It is this model that is actually used for the calculations, see annex C.

.../...

The result will be that the diversion of imports R to C is less than in the simpler case illustrated above and the price reduction in country I will be greater. In terms of welfare changes, the gains for I will be greater, those for C less and the losses for R reduced. In fact if the reduction in R's unit costs is sufficient, the rest of the world may also experience net gains.

All the algebraic details of the welfare calculations are given in annex C. Both the welfare areas and the price changes can be written in terms of the exogenous parameters: the trade shares, the elasticities, the cost reductions and the external tariff.

2.2 Stage 1, Public Procurement

Goods and services subject to public procurement restrictions warrant special attention. First of all, trade is often non-existent, and, secondly, the liberalising of these markets could be expected to lead to substantial long-term restructuring.

The immediate trade effect is considered as a distinct part of stage one. The consultancy report for public procurement (Atkins, 1987), has estimated potential cost savings from buying existing quantities of publicly procured goods more cheaply in other Community countries, taking account of the fact that costs do not necessarily remain the same under increased demand. Eighty per cent of these estimated cost savings (assuming that twenty per cent of publicly procured goods can only be tendered for locally) are added in to stage one results on a sector by sector basis, see Table 3, annex A. Any welfare effects due to lower border and trade costs are automatically considered in the stage one calculations.

2.3 Stage 2, Barriers affecting production cost

The discussion in section one also emphasised the potential reduction of regulatory activity across the Community leading to cost savings in the production of goods and services. Furthermore, the removal of internal trade barriers is expected to stimulate competition, greater technical efficiency and specialisation, adding to these cost savings. This process

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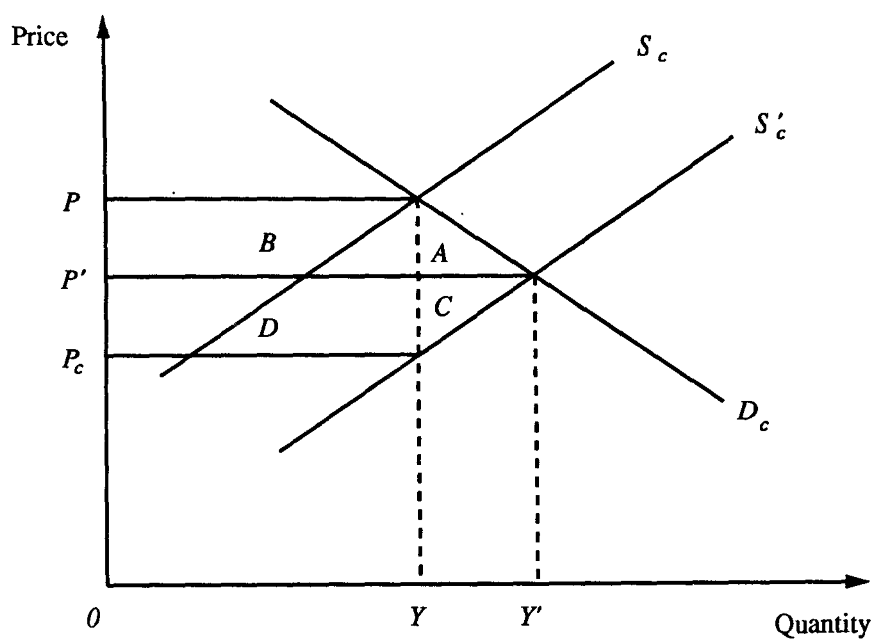
is treated in stage two as a downward shift in the supply curve for the Community, on a sector by sector basis. First the case of an autarkic Community is treated, followed by the situation in which the Community trades with the rest of the world.

Figure 3



In Figure 3 the supply and demand curves for the Community are used, rather than excess supply and excess demand curves. Community output, before and after cost reduction effects shift the supply curve down from S to S', are given respectively by Y and Y'. The pre- and post-shift Community prices are given respectively by P and P', where the actual cost reduction is from P to Pc.

The welfare effects consist of a consumer surplus gain of A + B and a producer surplus gain of C + D.

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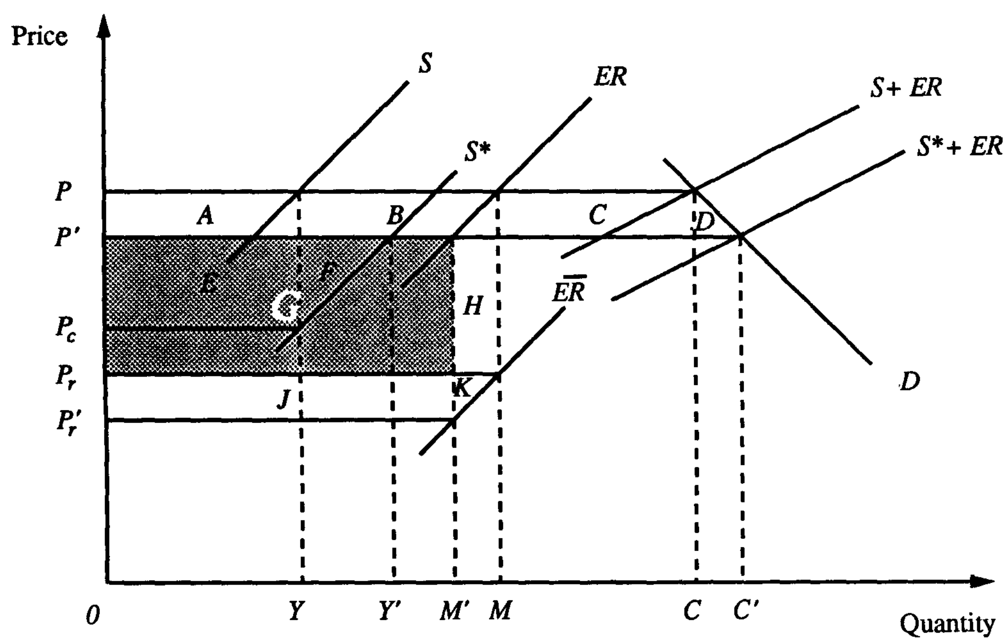
Figure 4 illustrates the non-autarkic case. The excess supply curve of the rest of the world, ER, is added to the supply curve of the Community S to give (S + ER). Community production is initially OY, with imports OM and consumption OC (equals OY + OM). Initial tariff revenues are (A+B+G+H) and the tariff rate t equals $(P-P_r)/P_r$.

Figure 4



Note: OY + OM = OC
OY' + OM' = OC'

Following the fall in the Community supply curve to S', Community output becomes OY', imports OM' and consumption OC'.

The welfare effects for the Community are: a consumer surplus gain of (A+B+C+D); a producer surplus gain of (E+F); a tariff loss of (A+B+G+H) - (G+J). The net gain to the Community is (C+D+E+F+J-H), while the rest of the world suffers a producer surplus loss of (J+K).

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2.4 Methodological problems

A number of methodological problems arise in this second stage. These include additional trade effects within the Community, the distinction between final and intermediate goods, the question of intra-industry trade and the distinction between cost and price.

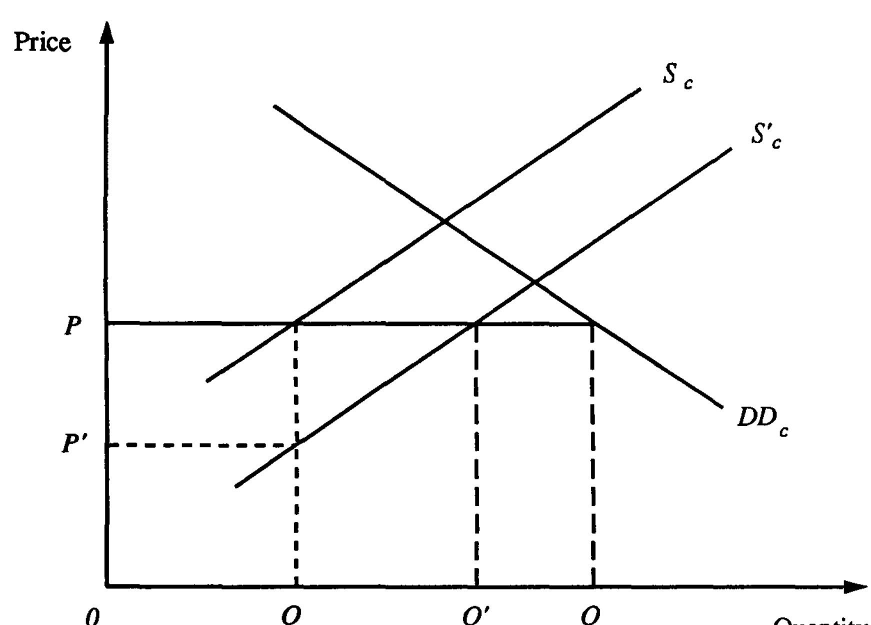
The treatment of the Community as a block means that second order trade effects between regions or countries, following the reduction in production cost, are ignored. Only the trade changes with the rest of the world are included. This omission can only be rectified by explicitly modelling the interaction between the national producers in the Community. Two remarks may be made about this omission. One is that these trade effects will be small relative to the welfare effects arising from lower production costs, although clearly they will be more important as the variance in the fall in production cost between different countries is larger. Furthermore, such effects will be more crucial to the way in which welfare increases are distributed between countries than to the aggregate gain in welfare itself.

A second problem is that production cost reductions and concomitant welfare gains occur at various stages of the production cycle and these should all be counted. There is also a significant interaction between branches of the economies as the output of one sector which can now be produced more cheaply is used as an input to other sectors. To cater for these two aspects, identified cost reductions by sector have been fed through the Community input-output matrix[6] to produce a resultant effect on a vector of final output. These resultant cost effects are the ones which have been used in the partial equilibrium calculations.

One of the difficulties of using the input-output matrix to trace through potential cost reductions concerns the interaction with the rest of the world. If as in figure 5, intermediate inputs are imported from the rest of the world at price P, then this will be unaffected by the downward shift in Community costs from S_c to S_c'. Total derived demand in the Community (DD_c) remains the same at Q while the quantity produced within the Community rises from Q_c to Q_c', all at a constant price P. The implicit assumption in the approach used, therefore, is that intermediate inputs are produced within the Community. For the inputs which produce the most significant cost effects, financial services, business services, telecommunications services, freight and air transport, this is indeed the case.

There are other small influences on the cost of goods and services produced as intermediate inputs. One is the economies of scale in the production of intermediate inputs. Because this effect requires the same input-output treatment, it is incorporated into stage two. However, the results are reported separately with those for economies of scale on final goods in stage three. A second small influence is the effect on production cost of intermediate inputs traded within the Community, which are now cheaper

Figure 5



because of lower trade barriers. This aspect has also been incorporated into the stage two calculations although, like the scale effects, it is rather insignificant compared to the specific sectoral cost effects which account for the major part of the stage two results.

The third problem concerns the existence of intra-industry trade. The simple Heckscher-Ohlin trade model, which is based on comparative advantage predicts that the same good will not be both imported and exported. In principle all that is needed is a sufficiently disaggregated level of trade elasticities to discover this phenomenon. But although intra-industry trade indices, (Grubel and Lloyd, 1975) decline at these lower levels, two-way trade is still observable.

This can be explained in two ways. Firstly, intra-industry trade in functionally homogeneous products can take place for a number of reasons, for example, where there exist transportation and storage costs. Secondly and more importantly, it arises because of economies of scale in the production of differentiated goods. Free trade allows both lower unit costs due to the scale effects of producing for larger markets and increased variety via two-way trade in differentiated goods.

In practice, in almost all products, intra-industry trade takes place. While the removal of barriers implies a rise in imports, when unit production costs are reduced, it is also likely that exports to the rest of the world will increase. This gives rise to additional producer surplus gains which are not quantified in the stage two methodology. The under-estimation of the welfare gains from ignoring these effects on exports will to some extent offset any loss in producer surplus which derives from producers outside the Community exploiting the removal of barriers, and in particular the adoption of Community standards, to increase their exports to the Community. Of course it cannot be assumed that the offset is exact but there is no reason to believe that the bias operates in one or other direction.

Finally, the important distinction between cost and price arises. The parameters for the trade and regulatory cost reductions are drawn in the main from a number of case studies (annex D) which predominantly focus on

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potential cost reductions. However, in a number of sectors characterised by significant market imperfections, prices are expected to fall further than cost, reflecting the compression of excess profits in addition to improved technical efficiency and other genuine cost savings. To the extent that these goods or services are used as intermediate inputs to other sectors or finally consumed these price changes will be the ones that that are passed on. However, the compression of excess profits means that the consequent transfer of welfare from producers to intermediate or final consumers has to be set against consumer gains to arrive at total welfare gains.

Such a cost/price distribution arises for several sectors e.g. financial services, agriculture and coal. The way in which net welfare changes are calculated is detailed in section 3.

2.5 Stage three, Economies of scale, existing plant

This stage quantifies the most immediate or static effect of economies of scale. The survey report on economies of scale, (Pratten, 1987) gives estimates of unit cost gradients at given proportions of minimum efficient scale for existing European plant in a number of sectors. If some simplifying assumptions are made concerning plant cost functions then it is possible to convert this information into a parameter or elasticity that links changes in unit cost to changes in production (Annex C).

The output increases in the Community from stages 1 and 2 following reduced trade and regulatory barriers give rise, therefore, to additional cost effects as increased production is spread across existing plant. In stage three the welfare gains arising from these unit cost reductions on final goods are considered (Annex C). The unit cost reductions from scale effects on intermediate goods have been included within the stage two calculations so that the input-output effects can be taken into account. The calculations are iterated in order that the unit cost reductions on intermediate goods from increased output can be incorporated into the overall calculation. Despite the inclusion of intermediate goods scale effects in stage two, all welfare gains due to economies of scale (both final and intermediate) are reported together in Table A6.

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Section 3: Data Requirements

The data required to undertake the calculations detailed in section 2 are summarised in Table 3.1. Coverage is limited to Germany, France, Italy, UK, and the Benelux countries, comprising about 88% of Community value-added in the year considered, 1985. Aggregate results are reported both for this group of countries, EUR7 in 1985 prices and also for EUR12 at 1988 prices, by scaling up proportionately using GDP.

In essence stages two and three and the adding-up stage operate at the R-44 level of sectoral disaggregation. This facilitates the use of the Community input-output table which corresponds to this level and which is essential for the workings of stage two. In contrast stage one operates at a rather more disaggregated level, Nace 3-digit.

As Table 3.1 indicates, the data needs are substantial and comprise trade and production data, elasticity estimates, the common external tariff and economies of scale parameters as well as estimates of the potential sectoral cost reductions following the removal of trade and regulatory barriers. This section concentrates on the cost reduction estimates. All other data aspects are discussed in Annex B.

3.1 Stage One

The calculations in this first stage cover the 65 predominantly final goods sectors which have been selected from the NACE 3-digit classification of 166 agricultural and manufacturing sectors. For two rather important sectors, agriculture and energy, a proportion of trade for the sector has been taken to correspond to the fraction of final output in total output. The sectors treated in stage one correspond to about 220 billion ECU of intra-EC imports or about 60% of intra-EC trade for the countries considered. It should be stressed that the stage one calculations have been undertaken using each of the Community countries in turn as an importing country. The results in Tables A2 and A3 report total welfare gains for EUR7. The average cost and price changes are weighted by sector and country importance.

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Table 3.1 : Data requirements

Parameters	Stage 1[1]	Stage 2[2]	Stage 3
Trade shares	s_c= share of imports from rest of EC s_r= share of imports from rest of world		
Consumption shares		s_y= share of AC provided by EC production s_m= share of AC provided by extra imports	
Elasticities	n= elasticity of import demand e_c= elasticity of excess supply from rest of EC e_r= elasticity of excess supply from ROW	e_{cd}= elasticity of demand in EC e_{cs}= elasticity of supply in EC e_r= elasticity of excess supply from ROW	
Common External Tariff	t by sector	t by sector	-
Price or cost Reduction	b= effect of lower trade barrier	w= cost reduction in EC	dependent on sectoral output increase
Economies of Scale	-	EOS parameter intermediate goods	EOS parameter final goods
Data for calculation of welfare amounts	Total imports by EC country per sector, M	Apparent Consumption of EC per sector, AC	EC Production per sector, Y

[1] On a country by country basis except for the CET.
[2] Apparent consumption, (AC) = Production (Y) + extra EC imports - extra EC exports.

Two principal sources of information have been used to generate the cost reductions which would ensue from the elimination of Community trade barriers. One is an industrial survey of firms' estimates of the cost of these barriers (Nerb, 1987). The other is a study specifically directed at the cost of border formalities, administrative costs and delays, (Ernst & Whinney, 1987). Two matrices of cost reduction estimates (by sector and country) have been constructed, based principally on these two sources; (Tables B1 and B2). However, the sectoral estimates have been checked for consistency with information from specific consultants' studies (Annex D) where this exists.

The first set of inputs (Table B1 and column (i) Table A3) are derived from the Ernst & Whinney study. The cost of border formalities comprises the administrative costs of both exporters and importers, agents' fees and border delays. The study provides estimates of these costs both by consignment and in relation to intra-Community trade value for exporters and importers within thirteen sectors, based on surveys of firms in Belgium, France, Germany, Italy, the Netherlands and the UK. These estimates have been converted (using an import share matrix) into an average cost figure (as a percentage of intra-EC imports) for each Member State and sector.

No adjustment has been made to these figures for the additional costs associated with satisfying national product norms or regulations. In general, therefore, these percentages can be considered to be a low estimate of the costs of barriers affecting intra-Community trade.

The other set of cost reduction estimates is based on the survey undertaken to assess the extent of trade barriers within the Community (Nerb, 1987). This survey indicated that the main barriers, in order of importance, are standards and regulations, administrative barriers, frontier delays followed by a number of other barriers such as sales tax differences, transport regulations and the differential implementation of Community law.

In addition enterprises were invited to indicate the expected unit cost savings from eliminated barriers. Sectoral responses for five countries, Germany, UK, Netherlands, Spain and Ireland are available, and for all

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countries the reasons for the expected cost reductions have been given. First in importance is lower distribution costs, then reduced costs of imported materials and cheaper production process and lastly lower banking, marketing and insurance costs.

However, for the calculations of stage one, it is the direct costs associated with delays, administrative procedures and producing for standards imposed in other Community countries which should be taken into account. The second set of estimates (Table B2 and column (ii) of Table A3) is derived by first transforming the survey data (using an import share matrix) to produce a cost reduction figure for each sector and each Member State as an importing country. On the basis of input-output coefficients, these figures have been adjusted downwards to account for the fact that the survey results include the indirect effects of the anticipated price reductions of intermediate goods and services. They have then been adjusted upwards to take account of the cost of border formalities borne by importers; this information is derived from the Ernst and Whinney study. In general this second set of cost reduction estimates is slightly greater than the first set. The range of the average cost saving is from 1.6 to 1.9 percent.

3.2 Stage two

The stage two calculations are based on aggregated Community data. They include the same seven countries as in the first stage and cover the 44 sectors of the NACE-CLIO R44 classification which is used for the Community input-output tables. Again, two sets of input data are used (see columns (i) and (ii) of Table A5), constituting lower and upper estimates of potential cost reductions of total final output.

This input data essentially includes three sources of cost reduction. By far the most important are the specific sectoral cost reductions due to de-regulation, but in addition there is the reduced cost of intermediate inputs imported from other Member States (and not covered in stage one) plus the effect of scale economies on intermediate goods.

For traded intermediate goods, cost reductions are taken from the sectoral estimates used in stage one and scaled down by the share of intra-Community

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trade in Community output. The effects of economies of scale in intermediate goods are incorporated using the parameters derived for stage three and the output increases which emerge from iterative calculations.

The cost reductions for financial and business services and telecommunications are based on the commissioned studies for these sectors (Price Waterhouse, 1987; Peat Marwick McLintock, 1987; Müller, 1987). Estimates for air and road transport and energy have been added for the sake of completeness. These sectors form the basis of column (i) of Table A5. For column (ii) price reductions for agriculture and steel are also incorporated.

In the case of the financial services sector, agriculture and also coal, potential price reductions are used in stage two, rather than potential cost reductions. However, such price reductions will, in the first two cases, derive to some extent from decreases in excess profits and, therefore, involve a transfer of welfare from producers to consumers. These full price reductions are used in conjunction with input-output tables to assess the effect on other sectors, but thereafter the welfare transferred is estimated and subtracted to derive the net gain. The fraction of price reduction due to the compression of rent is assumed to be three fifths in the case of agriculture (Thomson 1985). For financial services it has been assumed that one third of the increase in welfare should be deducted as it represents a transfer from producers to consumers.

In the case of the energy sector, de-regulation in the production of refined petroleum products and in the distribution of electricity should lead to genuine cost reductions for these sectors. For coal, the effects are of price rather than cost. The reduction of internal subsidies allows the import of coal at world prices. For this sector welfare changes were modelled in a slightly different way. It was assumed that internal subsidies on coal and restrictions on importing coal would be removed, leading to lower price and higher imports.

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Section 4: Results

The principal estimates of the potential welfare changes from eliminating internal market barriers are set out in Tables A2 to A6 with the results of the three stages summarised in Table A7. The cost of the barriers affecting trade only (final goods) including the static effects of public procurement restrictions is estimated at between 8 and 9 billion ECU (EUR7 at 1985 prices). The cost of barriers affecting all production is calculated at between 58 and 72 billion ECU, or 2.0-2.4% of GDP. Therefore, total potential benefits from barrier removal for these two stages are estimated at between 66 and 81 billion ECU or 2.2-2.7% of GDP. If these figures are scaled up to represent the same GDP share of EUR12 at 1988 prices the figures become 90-110 billion ECU. In addition there are the small benefits from scale economies on existing plant, 4-5 billion ECU for EUR 7 at 1985 prices.

These estimates should be viewed as potential gains in economic welfare if the full internal market programme is implemented. No attempt has been made to systematically estimate the likely outcome if certain barriers or market restrictions are not removed. Furthermore even these static benefits can be expected to take several years to materialise. The dynamic benefits or those due to market integration, which have been estimated as an an additional 62 to 107 billion ECU for EUR 7 at 1985 prices, are likely to take longer, possibly between five and ten years.

It is probably useful at this stage to examine the possible bias in the figures given. First of all, the detailed calculations apply to seven Member States since most of the quantitative information from consultants' studies and surveys relates to these countries. A simple linear scaling-up of the results for EUR7 can be expected to underestimate the total for EUR12 since qualitative information from the business survey (on potential reductions in production costs and increase in sales) indicates that internal market barriers are more significant for the other five countries.

A second source of bias derives from the use of partial techniques. Where the price effects are small, the bias is likely to be small even if the trade effects are large. Where the price effects are larger, as, for example, with financial services or some of the other service sectors, the

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omission of general equilibrium effects will entail greater bias. However, it is not obvious in which direction the bias will lie.

A third source of bias concerns the existence of monopoly or oligopoly power. To the extent that markets are characterised by market imperfections, the increase in output and therefore welfare is overestimated. However, this bias is relatively small because the significant welfare gains are on existing output. It also means that price reductions will have been overestimated, but, for a given cost reduction, the net gain will not be affected; there will simply be more producer gain and less consumer gain. Clearly where barrier removal implies an erosion of monopoly power it is important to exclude the reduction of excess profits where welfare is simply transferred from producers to consumers. For sectors where this information was available (e.g. agriculture, financial services), this adjustment has been made.

One of the aims of the internal market programme is to encourage market entry and competition. To the extent that the opening of markets could lead to greater market power at a European level by reducing and concentrating the firms in an industry, then a more active competition policy would be required. This question is addressed in some detail in Part D of "The Economics of 1992".

Fourthly, the use of unweighted averages for common external tariffs may produce a bias. Where the share of goods facing high tariffs would normally be large, in the absence of tariffs, relative to goods facing low tariffs, the unweighted average will be biased downwards. This leads to an underestimate of tariff loss and an overestimate of welfare gains. The bias is reversed for the converse situation. These sectoral biases are probably largely off-setting.

From the above discussion it is, therefore, not clear that there is any systematic bias in the estimates that have been produced. This does not exclude the fact that they may be subject to a considerable margin of error. The range of estimates given reflects uncertainty over the size of cost reduction effects following barrier removal.

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Section 5: Conclusions.

The modified partial equilibrium approach used in this paper has enabled a large amount of microeconomic data on the likely effects of market integration in the Community to be combined together in a systematic and transparent fashion. The resultant potential benefits in terms of economic welfare are sizeable, chiefly because non-tariff (as opposed to tariff) barriers are being removed and because of the significant effect on production cost in the Community.

The principal drawbacks of the methodology lie with its limitations. It fails to deal with certain major impacts of integration. One of the most important is the effect of increased competition and the consequent restructuring of the production structure. Such market integration effects have been estimated for the cost of non-Europe exercise calculating economies of scale effects (see chapter 9) and by generalising a number of representative sectoral calculations, Smith and Venables (1987). This latter estimate has been achieved by deriving multiplier coefficients with which to scale up the economic welfare gains developed here.

However, even these substantial integration effects do not exhaust the potential gains from internal market completion. There is evidence that there will be additional positive impacts on innovation (Geroski 1988) which will reinforce the gains from increased competition and may lead to an increase in the potential rate of economic growth.

Finally, by its nature, the partial equilibrium approach fails to take into account the indirect macroeconomic effects of cost reductions. The effects of increased output on investment and of increased factor incomes on savings are disregarded. The analysis leaves open the question of whether the potential gains associated with cost reductions are taken in the form of reduced prices (or possibly lower inflation) or higher output. This balance will to some extent be determined by the reactions of consumers and producers to market integration, but may also be influenced through the choice of monetary and fiscal policies. These issues are properly examined using macroeconomic models and are treated in Catinat, Donni and Italianer (1988).

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Footnotes

1 See 'Completing the Internal Market', White Paper from the Commission to the European Council, 1985.

2 The traditional terms 'static' and 'dynamic' of the trade literature are dropped in 'The Economics of 1992' report in favour of the more specific 'barrier removal' and 'integration' effects. The 'static' welfare calculations in this paper, therefore, correspond to barrier removal effects.

3 Customs procedures, involving frontier stops either at internal Community borders or inland, and related administrative costs borne inland by companies and the public authorities, are at present maintained within the Community for the following reasons:

- differences in value added tax rates and excise duties, which are currently applied in accordance with the "destination principle", and thus necessitate border tax adjustments in the Member State of destination;
- application of monetary compensatory amounts to trade in certain agricultural products in accordance with the Common Agricultural Policy;
- differences in national public health standards involve veterinary and plant health checks;
- checks to control road transport licenses, and the compliance of vehicles with national regulations including safety rules for the transport of dangerous products;
- formalities carried out for statistical purposes;
- the enforcement of certain bilateral trade quota regimes that Member States maintain with third countries, for example textile quotas under the multi-fibre agreement of the GATT and other miscellaneous national measures authorised under Article 115 of the Treaty of Rome.

4 See for example Cline et al (1978), Baldwin and Murray (1977).

5 It is of course possible to modify these traditional approaches to take account of non-competitive market structure, see for example Smith and Venables (1987) or Cox and Harris (1985).

6 Using the Leontieff inverse $(I-A)^{-1}$.

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ANNEX A

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Table A1 : Initial Values, Trade and Output EUR 7 (1985)

	Stage 1	
	Initial intra-EC imports (ECU bn)	Initial extra-EC imports (ECU bn)
Agriculture	11.15	6.81
Oil, Natural Gas	5.12	6.59
Mineral Oil Refining	9.47	5.66
Pharmaceuticals	3.57	5.73
Soap, Detergents	1.94	2.24
Household Chemicals	4.01	6.53
Metal Products	1.32	1.63
Boilermaking	.67	.81
Tools, metal Goods	5.35	7.90
Agric. Machinery	2.45	2.98
Machine Tools	2.75	5.12
Textile Machinery	1.24	2.23
Food, Chemical Mach.	3.44	5.02
Mining Equipment etc.	4.40	6.55
Transmission Equip.	2.19	3.56
Other Mach. Industry	2.17	3.39
Other Mach. Equip.	10.44	17.72
Office Machinery	13.51	26.70
Electrical Machinery	4.48	7.99
Telecom. Equipment	9.42	20.09
Radio Television	6.18	13.87
Dom. Electrical Equip.	3.19	4.49
Vehicles, Engines	27.83	39.90
Vehicle Bodies	.57	.67
Shipbuilding	.42	1.20
Rail Rolling Stock	.18	.29
Cycles, Motorcycles	.61	1.34
Aerospace	9.07	13.94
Optical Photographic	2.41	5.43
Clocks, Watches	.40	1.73
Vegetable, Animal Oils	2.87	7.83
Meat Preparation	10.27	14.05
Dairy Products	6.90	7.57
Fruit, Veg. Processing	3.28	6.12
Fish Processing	.93	2.30
Grain Milling	.79	1.28
Pasta	.22	.25
Starch Products	.62	1.14
Bread, Flour	.90	.99
Sugar Refining	.58	1.54
Cocoa, Choco., Sugar	2.34	2.96
Animal Food	1.25	1.66
Other Food Products	2.05	3.34
Ethyl, Distilling	1.00	1.17
Wine	.53	.90
Cider, Perry, Mead	.01	.02
Brewing	.70	.82
Soft Drinks, Water	.32	.34
Tobacco Products	2.01	2.11
Manufact. of Leather	.69	1.69
Footwear	3.69	6.09
Clothing	5.82	13.19
Household Textiles	.72	1.64
Fur Goods	.44	.89
Wooden Furniture	3.01	4.21
Printing	1.24	1.82
Publishing	1.24	.22
Rubber Products	.79	.01
Retread, Repair Tyres	.02	.42
Processed Plastics	1.61	.42
Jewellery	3.60	9.24
Musical Instruments	.17	.54
Photo.Processing	.12	.20
Toys, Sports Goods	1.23	2.88
Miscellaneous	7.49	11.87
Total	219.39	341.24

Source: VISA database, Commission

	Stage 2				
	Production (ECU bn)	Extra-EC Imports (ECU bn)	Extra-EC Exports (ECU bn)	Apparent Consumption (ECU bn)	Final Produc. (ECU bn)
Agriculture	173.28	101.33	17.54	257.07	35.77
Solid fuels	30.44	5.23	.21	35.46	3.85
Coke	4.09	.18	.44	3.82	.92
Oil, gas, petrol	238.73	95.34	16.38	317.69	69.64
Electr.,gas,water	170.64	.58	.51	170.71	55.78
Nuclear fuels	3.47	1.67	1.35	3.79	1.86
Ores, metals	158.30	29.30	24.90	162.70	16.16
Non-met. minerals	79.20	4.44	7.52	75.99	14.55
Chemicals	235.08	17.51	42.61	215.77	69.69
Metal articles	134.81	19.47	13.11	126.14	48.71
Mechanical engineering	158.52	17.51	54.59	121.44	103.05
Office machinery	48.49	19.47	14.97	52.98	31.60
Electrical goods	154.85	26.81	32.46	149.20	85.00
Motor vehicles	146.19	14.09	36.73	123.55	107.06
Other transport	45.61	6.50	10.70	41.41	25.94
Meats, preserves	48.32	3.78	1.88	50.22	38.91
Dairy products	58.67	.67	3.08	56.27	43.80
Other food products	158.94	8.60	7.55	159.99	89.57
Beverages	54.93	.69	4.14	51.48	27.85
Tobacco products	39.62	.10	.66	39.06	33.96
Textiles, clothing	126.01	20.44	17.21	129.24	75.73
Leather	25.48	4.98	5.45	25.02	18.88
Timber, furniture	68.82	7.96	3.99	72.79	32.07
Paper and products	131.11	12.73	6.98	136.86	28.13
Rubber, plastics	69.06	4.15	8.38	64.82	13.60
Other manufacturing	18.95	12.13	15.77	15.30	13.84
Building, civil engin.	327.26	.00	.00	327.26	261.27
Wholesale, retail trade	481.01	4.90	19.58	466.34	342.05
Lodging, catering	129.83	1.65	1.16	130.32	103.34
Inland transport	99.38	2.13	3.31	98.20	34.38
Sea, air transport	50.46	9.96	31.09	29.32	34.27
Auxiliary transport	44.90	5.65	5.51	45.04	6.29
Communications	77.97	1.03	.95	78.05	28.64
Credit and insurance	425.30	11.81	21.19	415.92	90.56
Rent	256.69	.77	.46	257.00	220.27
Other market services	213.65	5.22	5.10	213.77	155.28
Non-market services	627.51	.00	.00	627.51	627.27
Total	5315.59	469.39	437.47	5347.51	2989.55

Source: Sectoral and VISA database, Commission, Apparent Consumption = Production + Imports - Exports, Final Production from Input-Output tables

Note: The import figures for stage 1 only cover goods comprising final consumption, including investment goods. The trade figures for stage 2 cover both final and intermediate goods, together with services.

Table A.2: Results of Static Calculations, Stage 1

	Change in intra-EC imports (%)		Change in extra-EC imports (%)		Static Welfare gains (ECU bn)		Public Procure-ment (ECU bn)	Total gains (ECU bn)	
	A	B	A	B	A	B		A	B
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)
Agriculture	6.4	5.0	-1.8	-1.4	.4	.3	.0	.4	.3
Oil, Natural Gas	2.7	8.3	-.5	-1.6	.1	.2	.0	.1	.2
Mineral Oil Refining	1.7	5.4	-1.0	-2.9	.1	.3	.0	.1	.3
Pharmaceuticals	1.8	2.6	-1.7	-2.3	.0	.0	.9	1.0	1.0
Soap, Detergents	1.1	1.6	-2.2	-3.1	.0	.0	.0	.0	.0
Household Chemicals	1.8	2.5	-1.5	-2.1	.0	.1	.0	.0	.1
Metal Products	2.0	2.5	-3.3	-3.9	.0	.0	.0	.0	.0
Boilermaking	1.9	2.3	-3.4	-3.9	.0	.0	.0	.0	.0
Tools, metal Goods	2.6	3.2	-2.7	-3.4	.0	.1	.0	.1	.1
Agric. Machinery	5.7	5.1	-8.4	-7.8	.1	.1	.0	.1	.1
Machine Tools	7.6	7.3	-4.6	-4.5	.1	.1	.0	.1	.1
Textile Machinery	7.6	7.1	-5.1	-4.8	.0	.0	.0	.0	.0
Food, Chemical Mach.	6.3	6.0	-6.2	-6.0	.1	.1	.0	.1	.1
Mining Equipment etc.	6.4	6.2	-6.2	-6.0	.1	.1	.0	.1	.1
Transmission Equip.	7.0	6.7	-5.5	-5.4	.1	.1	.0	.1	.1
Other Mach. Industry	6.8	6.5	-5.8	-5.6	.1	.1	.0	.1	.1
Other Mach. Equip.	7.3	7.0	-5.5	-5.3	.3	.3	.1	.4	.4
Office Machinery	4.4	2.9	-3.1	-2.1	.3	.2	.2	.5	.4
Electrical Machinery	4.3	6.1	-3.0	-4.1	.1	.1	.0	.1	.1
Telecom. Equipment	4.9	6.9	-2.5	-3.5	.2	.2	.4	.5	.6
Radio Television	4.9	6.9	-2.3	-3.2	.1	.2	.0	.1	.2
Dom. Electrical Equip.	3.6	5.0	-4.0	-5.6	.1	.1	.0	.1	.1
Vehicles, Engines	1.1	3.4	-1.1	-3.6	.2	.5	.1	.2	.6
Vehicle Bodies	.8	2.5	-1.2	-4.1	.0	.0	.0	.0	.0
Shipbuilding	1.9	5.0	-.4	-1.1	.0	.0	.0	.0	.0
Rail Rolling Stock	1.4	3.3	-.6	-1.6	.0	.0	1.1	1.1	1.1
Cycles, Motorcycles	1.7	4.6	-.6	-1.5	.0	.0	.0	.0	.0
Aerospace	1.5	4.0	-.8	-2.0	.1	.2	.0	.1	.2
Optical Photographic	6.3	4.0	-3.1	-2.0	.1	.0	.0	.1	.0
Clocks, Watches	8.0	5.3	-1.5	-1.0	.0	.0	.0	.0	.0
Vegetable, Animal Oils	1.0	2.4	.0	.0	.0	.1	.0	.0	.1
Meat Preparation	.7	1.7	.0	.0	.1	.3	.0	.1	.3
Dairy Products	.7	1.6	.0	.0	.1	.2	.0	.1	.2
Fruit, Veg. Processing	.9	2.0	.0	.0	.0	.1	.0	.0	.1
Fish Processing	1.0	2.3	.0	.0	.0	.0	.0	.0	.0
Grain Milling	.8	1.8	.0	.0	.0	.0	.0	.0	.0
Pasta	.6	1.4	.0	.0	.0	.0	.0	.0	.0
Starch Products	.8	1.9	.0	.0	.0	.0	.0	.0	.0
Bread, Flour	.6	1.4	.0	.0	.0	.0	.0	.0	.0
Sugar Refining	1.0	2.2	.0	.0	.0	.0	.0	.0	.0
Cocoa, Choco., Sugar	.7	1.6	.0	.0	.0	.1	.0	.0	.1
Animal Food	.8	1.8	.0	.0	.0	.0	.0	.0	.0
Other Food Products	.8	1.8	.0	.0	.0	.1	.0	.0	.1
Ethyl, Distilling	1.3	2.9	-3.0	-7.2	.0	.0	.0	.0	.0
Wine	2.1	4.9	-1.8	-4.3	.0	.0	.0	.0	.0
Cider, Perry, Mead	1.8	4.2	-2.3	-5.5	.0	.0	.0	.0	.0
Brewing	1.2	2.9	-2.9	-7.2	.0	.0	.0	.0	.0
Soft Drinks, Water	1.1	2.4	-3.5	-7.2	.0	.0	.0	.0	.0
Tobacco Products	.8	2.0	.0	.0	.0	.0	.0	.0	.0
Manufact. of Leather	6.8	3.3	-3.1	-1.5	.0	.0	.0	.0	.0
Footwear	6.1	2.9	-3.9	-1.9	.1	.0	.0	.1	.0
Clothing	6.9	3.4	-2.5	-1.3	.1	.1	.1	.3	.2
Household Textiles	6.8	3.4	-2.6	-1.3	.0	.0	.0	.0	.0
Fur Goods	6.2	2.5	-2.4	-1.0	.0	.0	.0	.0	.0
Wooden Furniture	6.2	4.4	-6.4	-4.6	.1	.1	.0	.1	.1
Printing	3.2	2.8	-3.2	-2.8	.0	.0	.0	.0	.0
Publishing	3.2	2.8	-3.2	-2.8	.0	.0	.0	.0	.0
Rubber Products	3.6	4.5	-3.8	-4.8	.0	.0	.0	.0	.0
Retread, Repair Tyres	3.0	3.6	-4.0	-5.2	.0	.0	.0	.0	.0
Processed Plastics	3.2	4.0	-4.0	-5.1	.0	.0	.0	.0	.0
Jewellery	3.5	3.9	-1.2	-1.3	.1	.1	.0	.1	.1
Musical Instruments	5.5	6.0	-1.6	-1.7	.0	.0	.0	.0	.0
Photo.Processing	4.1	4.4	-3.0	-3.3	.0	.0	.0	.0	.0
Toys, Sports Goods	4.8	5.2	-2.1	-2.3	.0	.0	.0	.0	.0
Miscellaneous	3.6	3.8	-2.7	-2.9	.1	.2	.0	.2	.2
Total	3.7	4.5	-2.2	-2.6	3.8	5.1	3.9	7.7	9.0

Table A3: Results of static calculations, stage 1

	Cost Reduction stage 1 (%)		Change in Price (%)		Change in Imports (%)	
	A	B	A	B	A	B
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Agriculture	2.0	1.5	-.7	-.5	3.3	2.6
Oil, Natural Gas	.8	2.2	-.2	-.6	.9	2.7
Mineral Oil Refining	.8	2.3	-.3	-1.1	.7	2.3
Pharmaceuticals	.8	1.1	-.4	-.5	-.3	-.4
Soap, Detergents	.8	1.1	-.6	-.7	-.7	-.9
Household Chemicals	.8	1.1	-.4	-.5	-.3	-.4
Metal Products	1.2	1.5	-.8	-.8	-.9	-1.0
Boilermaking	1.2	1.5	-.8	-.9	-1.0	-1.1
Tools, metal Goods	1.2	1.5	-.7	-.7	-.6	-.7
Agric. Machinery	2.7	2.5	-1.7	-1.5	-2.0	-2.0
Machine Tools	2.4	2.3	-1.1	-1.0	-.4	-.4
Textile Machinery	2.4	2.3	-1.2	-1.0	-.6	-.5
Food, Chemical Mach.	2.4	2.3	-1.4	-1.2	-1.1	-1.1
Mining Equipment etc.	2.4	2.3	-1.3	-1.2	-1.1	-1.1
Transmission Equip.	2.4	2.3	-1.2	-1.1	-.8	-.8
Other Mach. Industry	2.4	2.3	-1.3	-1.2	-.9	-.9
Other Mach. Equip.	2.4	2.3	-1.2	-1.1	-.8	-.7
Office Machinery	1.4	.9	-.7	-.4	-.6	-.4
Electrical Machinery	1.4	2.0	-.7	-.9	-.3	-.5
Telecom. Equipment	1.4	2.0	-.6	-.8	-.1	-.2
Radio Television	1.4	2.0	-.6	-.8	-.1	-.1
Dom. Electrical Equip.	1.4	2.0	-.8	-1.1	-.8	-1.2
Vehicles, Engines	.5	1.6	-.3	-.9	-.2	-.7
Vehicle Bodies	.5	1.6	-.3	-1.0	-.3	-1.1
Shipbuilding	.5	1.4	-.1	-.2	.2	.5
Rail Rolling Stock	.5	1.3	-.2	-.2	.1	.3
Cycles, Motorcycles	.5	1.4	-.2	-.2	.2	.4
Aerospace	.5	1.5	-.2	-.5	.1	.4
Optical Photographic	2.1	1.3	-.9	-.5	-.2	-.1
Clocks, Watches	2.1	1.3	-.5	-.3	.3	.2
Vegetable, Animal Oils	1.0	2.3	-.4	1.0	.3	.6
Meat Preparation	1.0	2.3	-.6	-1.3	.3	.7
Dairy Products	1.1	2.4	-.7	-1.4	.3	.8
Fruit, Veg. Processing	1.0	2.3	-.6	-1.3	.3	.7
Fish Processing	.9	2.2	-.5	-1.0	.3	.7
Grain Milling	1.0	2.4	-.5	-1.2	.2	.7
Pasta	1.0	2.3	-.7	-1.5	.3	.7
Starch Products	1.0	2.3	-.5	-1.2	.3	.7
Bread, Flour	1.0	2.3	-.7	-1.5	.3	.7
Sugar Refining	.9	2.2	-.4	-.8	.3	.6
Cocoa, Choco., Sugar	1.0	2.3	-.6	-1.4	.3	.7
Animal Food	1.1	2.4	-.7	-1.3	.4	.8
Other Food Products	.9	2.3	-.5	-1.2	.3	.7
Ethyl, Distilling	1.0	2.3	-.7	-1.6	-1.0	-2.5
Wine	1.0	2.3	-.5	-1.2	-.4	-.9
Cider, Perry, Mead	1.0	2.3	-.6	-1.4	-.6	-1.5
Brewing	1.0	2.3	-.7	-1.6	-1.0	-2.6
Soft Drinks, Water	1.1	2.4	-.9	-.8	.4	-2.6
Tobacco Products	1.0	2.3	-.8	-1.7	-.3	1.0
Manufact. of Leather	2.3	1.1	-.9	-.4	-.1	-.1
Footwear	2.3	1.1	-1.1	-.4	.4	-.1
Clothing	2.3	1.1	-.8	-.4	.3	.2
Household Textiles	2.3	1.1	-.8	-.4	.4	.1
Fur Goods	2.0	.9	-.8	-.4	-1.2	.1
Wooden Furniture	3.1	2.2	-1.9	-1.3	-.6	-.8
Printing	1.6	1.4	-.9	-.7	-.6	-.6
Publishing	1.6	1.4	-.9	-.7	1.9	-.5
Rubber Products	1.6	2.1	-.9	-1.1	1.5	2.4
Retread, Repair Tyres	1.6	2.0	-1.0	-1.2	1.7	1.7
Processed Plastics	1.6	2.0	-1.0	-1.2	1.7	2.1
Jewellery	1.4	1.6	-.5	-.6	.2	.2
Musical Instruments	1.7	1.8	-.5	-.5	.1	.1
Photo.Processing	1.6	1.8	-.8	-.8	-.4	-.4
Toys, Sports Goods	1.6	1.8	-.6	-.6	-.0	-.1
Miscellaneous	1.6	1.7	-.8	-.4	-.3	-.3
Total	1.6	1.9	-.7	-.8	.1	.2

Table A.4: Results of Static Calculations, Stage 2

	Change in output (%)		Change in extra-EC imports (%)		Static Welfare gains (ECU bn)	
	A	B	A	B	A	B
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Agriculture	.4	2.9	.0	.0	.4	2.8
Solid fuels	.0	.0	2.4	2.9	.0	.1
Coke	.0	.0	3.9	4.4	.0	.0
Oil, gas, petrol	2.7	2.7	-4.3	-4.4	1.1	1.1
Electr.,gas,water	2.7	2.8	-31.5	-32.0	3.3	3.3
Nuclear fuels	.0	.0	.0	.0	.0	.0
Ores, metals	2.3	8.4	-8.6	-31.0	.5	1.7
Non-met. minerals	1.1	1.2	-8.3	-9.1	.3	.3
Chemicals	1.7	1.8	-9.5	-10.4	1.7	1.9
Metal articles	.8	1.4	-7.1	-12.4	.7	1.2
Mechanical engineering	1.4	2.0	-6.0	-8.4	1.6	2.3
Office machinery	3.4	3.9	-5.8	-6.7	1.1	1.3
Electrical goods	1.9	2.6	-5.8	-7.7	1.8	2.3
Motor vehicles	1.4	2.0	-5.4	-7.4	1.8	2.5
Other transport	1.7	2.2	-5.2	-6.7	.5	.6
Meats, preserves	.4	1.5	.0	.0	.4	1.5
Dairy products	.4	1.5	.0	.0	.5	1.8
Other food products	.4	1.0	.0	.0	1.0	2.2
Beverages	.5	.6	-1.9	-2.5	.3	.5
Tobacco products	.2	.3	-2.2	-3.2	.2	.2
Textiles, clothing	1.7	1.8	-5.3	-5.8	1.5	1.7
Leather	1.8	2.2	-5.2	-6.4	.4	.5
Timber, furniture	1.6	2.2	-5.4	-7.4	.6	.8
Paper and products	1.7	1.8	-6.2	-6.7	.5	.6
Rubber, plastics	1.6	1.8	-7.3	-8.1	.3	.3
Other manufacturing	3.4	4.6	-4.4	-6.0	.5	.6
Building, civil engin.	1.0	1.2	-2.0	-2.4	4.2	4.9
Wholesale, retail trade	.9	.9	.0	.0	3.5	3.8
Lodging, catering	.9	1.4	.0	.0	1.1	1.8
Inland transport	2.8	2.8	-7.6	-7.7	1.5	1.5
Sea, air transport	3.5	3.6	-10.3	-10.4	1.4	1.4
Auxiliary transport	1.1	1.2	-5.3	-5.6	.1	.1
Communications	3.0	3.0	-30.7	-30.9	1.7	1.7
Credit and insurance	6.7	6.7	-60.9	-61.3	10.5	10.6
Rent	.4	.4	-3.5	-3.7	1.5	1.6
Other market services	.7	.7	.0	.0	5.9	6.0
Non-market services	.6	.7	.0	.0	5.8	6.4
Total	1.3	1.5	-5.7	-7.7	58.0	71.8

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Table A5: Results of static calculations, stage 2

	Cost Reduction Stage 2 (%)		Change in Price (%)		Change in total output (%)	
	A	B	A	B	A	B
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Agriculture	0.8	5.9	-.5	-3.9	.4	2.9
Solid fuels	1.1	1.3	-6.4	-1.3	.8	1.0
Coke	1.4	1.6	-4.9	-1.4	1.0	1.1
Oil, gas, petrol	1.3	1.3	-.8	-.7	2.7	2.7
Electr.,gas,water	5.8	5.9	-5.3	-5.3	2.7	2.8
Nuclear fuels	1.6	1.7	-.1	.0	.0	.0
Ores, metals	1.9	6.9	-1.5	-5.2	2.3	8.4
Non-met. minerals	1.6	1.8	-1.4	-1.5	1.1	1.2
Chemicals	1.9	2.1	-1.6	-1.7	1.7	1.8
Metal articles	1.4	2.4	-1.2	-2.1	.8	1.4
Mechanical engineering	1.4	1.9	-1.0	-1.4	1.4	2.0
Office machinery	1.7	2.0	-1.0	-1.1	3.4	3.9
Electrical goods	1.4	1.8	-1.0	-1.3	1.9	2.6
Motor vehicles	1.5	2.1	-1.1	-1.5	1.4	2.0
Other transport	1.5	1.9	-.7	-1.3	1.7	2.2
Meats, preserves	0.9	4.0	-.8	-2.9	.4	1.5
Dairy products	1.1	4.3	-.8	-3.2	.4	1.5
Other food products	1.1	2.6	-.9	-1.9	.4	1.0
Beverages	1.3	1.7	-.9	-1.3	.5	.6
Tobacco products	0.5	0.7	-.4	-.5	.2	.3
Textiles, clothing	1.3	1.5	-.9	-1.0	1.7	1.8
Leather	1.4	1.7	-.9	-1.1	1.8	2.2
Timber, furniture	1.3	1.8	-.9	-1.2	1.6	2.2
Paper and products	1.5	1.6	-1.1	-1.1	1.7	1.8
Rubber, plastics	1.6	1.8	-1.2	-1.4	1.6	1.8
Other manufacturing	1.5	2.1	-.8	-1.0	3.4	4.6
Building, civil engin.	.13	1.5	-1.0	-1.2	1.0	1.2
Wholesale, retail trade	1.1	1.1	-.9	-.9	.9	.9
Lodging, catering	1.1	1.7	-.9	-1.4	.9	1.4
Inland transport	4.4	4.4	-3.8	-3.9	2.8	2.8
Sea, air transport	6.2	6.3	-5.2	-5.2	3.5	3.6
Auxiliary transport	1.1	1.2	-.9	-.9	1.1	1.2
Communications	5.7	5.8	-5.1	-5.1	3.0	3.0
Credit and insurance	11.5	11.6	-10.2	-10.2	6.7	6.7
Rent	0.7	0.7	-.6	-.6	.4	.4
Other market services	3.8	3.9	-3.6	-3.7	.7	.7
Non-market services	0.9	1.0	-.8	-.9	.6	.7
Average	2.4	3.0	-1.5	-1.8	1.3	1.5

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Table A6: Economies of scale and total static welfare effects

	EOS[1] Parameter	EOS Welfare Gains[2] Intermediate goods		Final Goods		Total static Welfare Gains[2]	
		A	B	A	B	A	B
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)
Agriculture	0	.0	.0	.0	.0	.0	.0
Solid fuels	0	.0	.0	.0	.0	.0	.0
Coke	0	.0	.0	.0	.0	.0	.0
Oil, gas, petrol	0.12	.0	.0	.3	.6	.4	.6
Electr.,gas,water	0	.0	.0	.0	.0	.0	.0
Nuclear fuels	0	.0	.0	.0	.0	.0	.0
Ores, metals	0.11	.1	.2	.0	.2	.1	.4
Non-met. minerals	0.05	.0	.0	.0	.0	.0	.0
Chemicals	0.12	.2	.2	.2	.2	.3	.4
Metal articles	0.06	.1	.1	.0	.1	.1	.2
Mechanical engineering	0.1	.1	.2	.5	.5	.6	.7
Office machinery	0.11	.1	.1	.3	.3	.4	.4
Electrical goods	0.08	.2	.2	.3	.4	.5	.6
Motor vehicles	0.14	.2	.2	.3	.5	.4	.7
Other transport	0.12	.0	.0	.1	.2	.1	.2
Meats, preserves	0.04	.0	.0	.0	.0	.0	.0
Dairy products	0.04	.0	.0	.0	.0	.0	.0
Other food products	0.04	.0	.0	.0	.1	.1	.1
Beverages	0.04	.0	.0	.0	.0	.0	.0
Tobacco products	0.03	.0	.0	.0	.0	.0	.0
Textiles, clothing	0.03	.0	.0	.1	.0	.1	.1
Leather	0.03	.0	.0	.0	.0	.1	.0
Timber, furniture	0.04	.0	.0	.0	.0	.1	.1
Paper and products	0.07	.0	.0	.0	.0	.1	.1
Rubber, plastics	0.04	.0	.0	.0	.0	.0	.0
Other manufacturing	0.04	.0	.0	.1	.1	.1	.1
Building, civil engin.	0	.1	.1	.0	.0	.1	.1
Wholesale, retail trade		.1	.1	.0	.0	.1	.1
Lodging, catering		.0	.0	.0	.0	.0	.0
Inland transport		.0	.0	.0	.0	.0	.0
Sea, air transport		.0	.0	.0	.0	.0	.0
Auxiliary transport		.0	.0	.0	.0	.0	.0
Communications		.0	.0	.0	.0	.0	.0
Credit and insurance		.0	.0	.0	.0	.0	.0
Rent		.0	.0	.0	.0	.0	.0
Other market services		.0	.0	.0	.0	.0	.0
Non-market services		.1	.1	.0	.0	.1	.1
Total		1.5	1.8	2.4	3.3	3.9	5.1

[1] Percentage reduction in average cost for a one per cent increase in output (see Annex C3).
[2] Billion ECU.

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Table A7: Total static welfare effects (bn ECU)

	(I) Trade PP		(II) Production Cost		(III) Economies of Scale		Total	
	A	B	A	B	A	B	A	B
Agriculture	.4	.3	.4	2.8	.0	.0	.8	3.1
Solid fuels	.0	.0	.0	.1	.0	.0	.1	.1
Coke	.0	.0	.0	.0	.0	.0	.0	.0
Oil, gas, petrol	.2	.5	1.1	1.1	.4	.6	1.6	2.3
Electr.,gas,water	.0	.0	3.3	3.3	.0	.0	3.3	3.3
Nuclear fuels	.0	.0	.0	.0	.0	.0	.0	.0
Ores, metals	.0	.0	.5	1.7	.1	.4	.6	2.1
Non-met. minerals	.0	.0	.3	.3	.0	.0	.3	.3
Chemicals	1.0	1.0	1.7	1.9	.3	.4	3.1	3.3
Metal articles	.1	.1	.7	1.2	.1	.2	.9	1.5
Mechanical engineering	1.0	.9	1.6	2.3	.6	.7	3.2	3.9
Office machinery	.6	.4	1.1	1.3	.4	.4	2.0	2.1
Electrical goods	.8	1.0	1.8	2.3	.5	.6	3.0	1.8
Motor vehicles	.2	.6	1.8	2.5	.4	.7	2.5	2.0
Other transport	1.2	1.3	.5	.6	.1	.2	1.8	2.8
Meats, preserves	.1	.3	.4	1.5	.0	.0	.5	.5
Dairy products	.1	.2	.5	1.8	.0	.0	.6	.3
Other food products	.2	.5	1.0	2.2	.1	.1	1.2	1.8
Beverages	.0	.1	.3	.5	.0	.0	.4	.7
Tobacco products	.0	.0	.2	.2	.0	.0	.2	.9
Textiles, clothing	.1	.1	1.5	1.7	.1	.1	1.7	.7
Leather	.3	.2	.4	.5	.1	.0	.7	.4
Timber, furniture	.1	.1	.6	.8	.1	.1	.7	1.0
Paper and products	.1	.1	.5	.6	.1	.1	.7	5.9
Rubber, plastics	.0	.1	.3	.3	.0	.0	.3	3.8
Other manufacturing	.3	.3	.5	.6	.1	.1	.8	1.8
Building, civil engin.	.9	.9	4.2	4.9	.1	.1	5.3	5.9
Wholesale, retail trade	.0	.0	3.5	3.8	.1	.1	3.6	3.8
Lodging, catering	.0	.0	1.1	1.8	.0	.0	1.1	1.8
Inland transport	.0	.0	1.5	1.5	.0	.0	1.5	1.5
Sea, air transport	.0	.0	1.4	1.4	.0	.0	1.4	1.4
Auxiliary transport	.0	.0	.1	.1	.0	.0	.1	.1
Communications	.0	.0	1.7	1.7	.0	.0	1.7	1.7
Credit and insurance	.0	.0	10.5	10.6	.0	.0	10.5	10.6
Rent	.0	.0	1.5	1.6	.0	.0	.15	1.6
Other market services	.0	.0	5.9	6.0	.0	.0	5.9	6.0
Non-market services	.0	.0	5.8	6.4	.1	.1	5.9	6.5
Total	7.7	9.0	58.0	71.8	3.9	5.1	69.6	85.8

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Annex B

Data Requirements

In addition to estimates of non-tariff barrier cost reductions stages one and two also require trade and output data, the relevant price elasticities and the common external tariff (CET). For the calculations of the static trade effects in stage one, price elasticities of import demand in each EC country are required plus export elasticities for both the rest of the Community and the rest of the world. Assuming perfectly substitutablegoods these elasticities can be derived from industry supply and demand curves. In practise the industry supply curves may be difficult to define because of oligopoly power.

Trade and output

Trade data for stage one which considers only trade in final manufactured and agricultural goods are drawn from the VISA databank for the EC, in this case at Nace 3-digit level and distinguishing intra-EC and extra-EC imports. For stage two which considers the whole economy but at an aggregate Community (the above seven countries) level, both production data and data for trade in services are required. The production or output data are drawn from the Commission's sectoral database which operates at the R-25 level. Where necessary these sectoral data are disaggregated using country-specific input-output tables to the R-44 level. The correspondance between R-44 and R-25 is given in Table B8. Data on extra-EC exports and extra-EC imports for the individual countries is taken from the VISA databank for manufactured and agricultural goods. For services the trade data from the most recent country input-output tables are taken and scaled up by the appropriate increase in output to produce 1985 figures. The data on output and extra-EC trade are then aggregated for the seven countries and transformed to give a data series for apparent consumption.

Elasticities

For the seven EC countries and for each sector import demand elasticities have been selected on the basis of a literature search, the main sources

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being Stern, Francis and Schumacher (1976) and the studies undertaken within the Cambridge Growth Project. The latter constitute the most comprehensive set of disaggregated import price elasticities that are available. For countries other than the UK, elasticities have been selected (i) by taking account of Stern et alia's best point estimates which are generally at a higher level of aggregation, (ii) by analogy with those for the UK and (iii) by taking into account the fact that high import consumption sectors usually imply low price elasticities of demand and that elasticities are typically greater for manufactured goods than for non-manufactured goods; furthermore that among the latter, elasticities are typically higher for raw materials than for food and beverages.

Econometric estimates of export supply elasticities for either the Community or the rest of the world are less evident. The parameters used here are based on surveys (Goldstein and Khan (1985), Davenport, (1986)) and on the expectation that these estimates are inversely correlated with the degree of export openness and positively correlated with real GNP (Gylfason 1978). It has been assumed that each Community country faces the same rest-of-the-Community supply elasticity.

Most processed foodstuffs entering the Community from outside face a tariff and some are subject to a variable levy. This levy is determined by the prevailing price of products for which there is a Common Agricultural Policy regime and effectively excludes a supply reaction from the rest of the world to changes in internal Community prices. Therefore the export elasticity of the rest of the world was artificially set equal to zero for meat products, dairy products, cereals and sugar.

For stage two where the impact of Community-wide cost reductions, both on goods produced for dometic consumption and on those destined for export, is calculated, demand and supply elasticities by sector for the Community are required. The uncompensated demand elasticities are based on the Hermes model results (Italianer 1986) for the various national estimates of the Rotterdam specification developed by Barten (1969). These estimates are supplemented with more recent studies using the same or similar specifications (Lluch et alia 1977).

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A survey of econometric models having some sectoral breakdown of the determination of capital formation demonstrates the extreme sensitivity of the estimate of the price elasticity of demand for investment goods to model specification. These elasticities were, in effect, set at unity. A complete list of the elasticities used is given in Tables B3-B5.

Common External Tariff

Tables B6 and B7 detail the values that have been used for the common external tariff (CET). The CET is actually levied on about six thousand goods according to their Nimexe classification. The main source of the values used here (which are unweighted averages for sectoral classifications) is material produced by the GATT Committee on Trade and Development.

Economies of scale

Finally, it is necessary to have economies of scale parameters for use in stage three where scale effects on final goods are treated and for scale effects on intermediate goods in stage two. From the information on the cost gradient at a given percentage of minimum efficient scale (see Pratten 1987) it is possible to derive a sectoral relationship between increases in production or output and reductions in unit cost provided some assumption is made regarding the form of the cost function and that it is assumed that extra production gets spread in an even fashion across average-sized plants which are producing below minimum efficient scale. This has been done at Nace 2-digit level to produce what is essentially a rather static measure of economies of scale, i.e. assuming extra output is spread across existing plant without any restructuring of capacity. The parameters are given in Table A6.

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Table B1: Cost Reductions by sector and country for stage 1A

	D	F	I	NL	B	UK
Agriculture	2.9	1.8	1.6	1.5	1.4	1.5
Oil, Natural Gas	.7	.8	.8	1.0	.8	.7
Mineral Oil Refining	.7	.8	.8	1.0	.8	.7
Pharmaceuticals	.4	.7	1.6	1.0	.5	.7
Soap, Detergents	.4	.7	1.6	1.0	.5	.7
Household Chemicals	.4	.7	1.6	1.0	.5	.7
Metal Products	1.5	.8	1.8	.5	.5	.7
Boilermaking	1.5	.8	1.8	.5	.5	.7
Tools, metal Goods	1.5	.8	1.8	.5	.5	.7
Agric. Machinery	1.9	4.0	2.5	1.6	1.6	2.1
Machine Tools	1.9	4.0	2.5	1.6	1.6	2.1
Textile Machinery	1.9	4.0	2.5	1.6	1.6	2.1
Food, Chemical Mach.	1.9	4.0	2.5	1.6	1.6	2.1
Mining Equipment etc.	1.9	4.0	2.5	1.6	1.6	2.1
Transmission Equip.	1.9	4.0	2.5	1.6	1.6	2.1
Other Mach. Industry	1.9	4.0	2.5	1.6	1.6	2.1
Other Mach. Equip.	1.9	4.0	2.5	1.6	1.6	2.1
Office Machinery	1.1	1.4	1.9	1.2	1.5	1.6
Electrical Machinery	1.1	1.4	1.9	1.2	1.5	1.6
Telecom. Equipment	1.1	1.4	1.9	1.2	1.5	1.6
Radio Television	1.1	1.4	1.9	1.2	1.5	1.6
Dom. Electrical Equip.	1.1	1.4	1.9	1.2	1.5	1.6
Vehicles, Engines	.5	.4	.7	.5	.3	.5
Vehicle Bodies	.5	.4	.7	.5	.3	.5
Shipbuilding	.5	.4	.7	.5	.3	.5
Rail Rolling Stock	.5	.4	.7	.5	.3	.5
Cycles, Motorcycles	.5	.4	.7	.5	.3	.5
Aerospace	.5	.4	.7	.5	.3	.5
Optical Photographic	1.5	2.3	2.5	3.3	1.8	1.9
Clocks, Watches	1.5	2.3	2.5	3.3	1.8	1.9
Vegetable, Animal Oils	1.4	.7	1.1	.7	1.8	.5
Meat Preparation	1.4	.7	1.1	.7	1.8	.5
Dairy Products	1.4	.7	1.1	.7	1.8	.5
Fruit, Veg. Processing	1.4	.7	1.1	.7	1.8	.5
Fish Processing	1.4	.7	1.1	.7	1.8	.5
Grain Milling	1.4	.7	1.1	.7	1.8	.5
Pasta	1.4	.7	1.1	.7	1.8	.5
Starch Products	1.4	.7	1.1	.7	1.8	.5
Bread, Flour	1.4	.7	1.1	.7	1.8	.5
Sugar Refining	1.4	.7	1.1	.7	1.8	.5
Cocoa, Choco., Sugar	1.4	.7	1.1	.7	1.8	.5
Animal Food	1.4	.7	1.1	.7	1.8	.5
Other Food Products	1.4	.7	1.1	.7	1.8	.5
Ethyl, Distilling	1.4	.7	1.1	.7	1.8	.5
Wine	1.4	.7	1.1	.7	1.8	.5
Cider, Perry, Mead	1.4	.7	1.1	.7	1.8	.5
Brewing	1.4	.7	1.1	.7	1.8	.5
Soft Drinks, Water	1.4	.7	1.1	.7	1.8	.5
Tobacco Products	1.4	.7	1.1	.7	1.8	.5
Manufact. of Leather	2.3	2.5	1.4	2.2	2.6	2.2
Footwear	2.3	2.5	1.4	2.2	2.6	2.2
Clothing	2.3	2.5	1.4	2.2	2.6	2.2
Household Textiles	2.3	2.5	1.4	2.2	2.6	2.2
Fur Goods	2.3	2.5	1.4	2.2	2.6	2.2
Wooden Furniture	1.8	5.1	5.6	3.2	2.2	2.3
Printing	1.6	1.8	1.9	1.5	1.2	1.5
Publishing	1.6	1.8	1.9	1.5	1.2	1.5
Rubber Products	1.6	1.8	1.9	1.5	1.2	1.5
Retread, Repair Tyres	1.6	1.8	1.9	1.5	1.2	1.5
Processed Plastics	1.6	1.8	1.9	1.5	1.2	1.5
Jewellery	1.6	1.8	1.9	1.5	1.2	1.5
Musical Instruments	1.6	1.8	1.9	1.5	1.2	1.5
Photo.Processing	1.6	1.8	1.9	1.5	1.2	1.5
Toys, Sports Goods	1.6	1.8	1.9	1.5	1.2	1.5
Miscellaneous	1.6	1.8	1.9	1.5	1.2	1.5
Total	1.6	1.8	1.9	1.5	1.2	1.5

Table B2: Cost reductions by sector and country for stage 1B

	D	F	I	NL	B	UK
Agriculture	2.2	1.4	1.3	1.2	1.1	1.2
Oil, Natural Gas	3.1	2.3	1.9	2.0	2.1	1.3
Mineral Oil Refining	3.1	2.3	1.9	2.0	2.1	1.3
Pharmaceuticals	1.1	.9	1.5	1.3	.9	.9
Soap, Detergents	1.1	.9	1.5	1.3	.9	.9
Household Chemicals	1.1	.9	1.5	1.3	.9	.9
Metal Products	1.8	1.3	1.6	1.2	1.7	1.6
Boilermaking	1.8	1.3	1.6	1.2	1.7	1.6
Tools, metal Goods	1.8	1.3	1.6	1.2	1.7	1.6
Agric. Machinery	2.3	3.1	2.2	1.5	1.7	2.3
Machine Tools	2.3	3.1	2.2	1.5	1.7	2.3
Textile Machinery	2.3	3.1	2.2	1.5	1.7	2.3
Food, Chemical Mach.	2.3	3.1	2.2	1.5	1.7	2.3
Mining Equipment etc.	2.3	3.1	2.2	1.5	1.7	2.3
Transmission Equip.	2.3	3.1	2.2	1.5	1.7	2.3
Other Mach. Industry	2.3	3.1	2.2	1.5	1.7	2.3
Other Mach. Equip.	2.3	3.1	2.2	1.5	1.7	2.3
Office Machinery	.7	1.0	1.3	.9	.9	1.0
Electrical Machinery	1.8	1.9	2.3	1.8	2.2	2.2
Telecom. Equipment	1.8	1.9	2.3	1.8	2.2	2.2
Radio Television	1.8	1.9	2.3	1.8	2.2	2.2
Dom. Electrical Equip.	1.8	1.9	2.3	1.8	2.2	2.2
Vehicles, Engines	1.8	1.9	2.3	1.8	2.2	2.2
Vehicle Bodies	1.8	1.9	2.3	1.8	2.2	2.2
Shipbuilding	1.7	1.2	1.1	1.0	1.3	1.5
Rail Rolling Stock	1.7	1.2	1.1	1.0	1.3	1.5
Cycles, Motorcycles	1.7	1.2	1.1	1.0	1.3	1.5
Aerospace	1.7	1.2	1.1	1.0	1.3	1.5
Optical Photographic	.5	1.4	1.8	2.2	1.2	1.6
Clocks, Watches	.5	1.4	1.8	2.2	1.2	1.6
Vegetable, Animal Oils	2.6	2.0	2.4	2.1	3.0	2.0
Meat Preparation	2.6	2.0	2.4	2.1	3.0	2.0
Dairy Products	2.6	2.0	2.4	2.1	3.0	2.0
Fruit, Veg. Processing	2.6	2.0	2.4	2.1	3.0	2.0
Fish Processing	2.6	2.0	2.4	2.1	3.0	2.0
Grain Milling	2.6	2.0	2.4	2.1	3.0	2.0
Pasta	2.6	2.0	2.4	2.1	3.0	2.0
Starch Products	2.6	2.0	2.4	2.1	3.0	2.0
Bread, Flour	2.6	2.0	2.4	2.1	3.0	2.0
Sugar Refining	2.6	2.0	2.4	2.1	3.0	2.0
Cocoa, Choco., Sugar	2.6	2.0	2.4	2.1	3.0	2.0
Animal Food	2.6	2.0	2.4	2.1	3.0	2.0
Other Food Products	2.6	2.0	2.4	2.1	3.0	2.0
Ethyl, Distilling	2.6	2.0	2.4	2.1	3.0	2.0
Wine	2.6	2.0	2.4	2.1	3.0	2.0
Cider, Perry, Mead	2.6	2.0	2.4	2.1	3.0	2.0
Brewing	2.6	2.0	2.4	2.1	3.0	2.0
Soft Drinks, Water	2.6	2.0	2.4	2.1	3.0	2.0
Tobacco Products	2.6	2.0	2.4	2.1	3.0	2.0
Manufact. of Leather	.8	1.3	1.2	1.6	1.4	1.1
Footwear	.8	1.3	1.2	1.6	1.4	1.1
Clothing	.8	1.3	1.2	1.6	1.4	1.1
Household Textiles	.8	.9	1.2	1.6	1.4	1.1
Fur Goods	.8	.1	1.2	1.6	1.4	1.1
Wooden Furniture	1.3	3.8	3.9	2.2	1.3	1.5
Printing	1.4	1.5	1.5	1.3	1.2	1.4
Publishing	1.4	1.5	1.5	1.3	1.2	1.4
Rubber Products	2.4	1.9	1.9	1.6	2.1	2.1
Retread, Repair Tyres	2.4	1.9	1.9	1.6	2.1	2.1
Processed Plastics	2.4	1.9	1.9	1.6	2.1	2.1
Jewellery	1.7	1.9	2.0	1.8	1.5	1.7
Musical Instruments	1.7	1.9	2.0	1.8	1.5	1.7
Photo.Processing	1.7	1.9	2.0	1.8	1.5	1.7
Toys, Sports Goods	1.7	1.9	2.0	1.8	1.5	1.7
Miscellaneous	1.7	1.9	2.0	1.8	1.5	1.7
Total	2.2	2.0	2.0	1.7	1.7	1.8

Table B3: Excess Demand Elasticities by sector and country, stage 1

	D	F	I	UK	NL	B/L
Agriculture	-1.8	-1.8	-1.2	-1.4	-1.1	-1.3
Oil, Natural Gas	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Mineral Oil Refining	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Pharmaceuticals	-1.7	-1.6	-1.0	-1.2	-.9	-1.1
Soap, Detergents	-1.7	-1.6	-1.0	-1.2	-.9	-1.1
Household Chemicals	-1.7	-1.6	-1.0	-1.2	-.9	-1.1
Metal Products	-1.7	-1.6	-1.0	-1.2	-.9	-1.1
Boilermaking	-1.7	-1.6	-1.0	-1.2	-.9	-1.1
Tools, metal Goods	-1.7	-1.6	-1.0	-1.2	-.9	-1.1
Agric. Machinery	-2.0	-2.0	-1.4	-1.6	-1.3	-1.6
Machine Tools	-2.0	-2.0	-1.4	-1.6	-1.3	-1.6
Textile Machinery	-2.0	-2.0	-1.4	-1.6	-1.3	-1.6
Food, Chemical Mach.	-2.0	-2.0	-1.4	-1.6	-1.3	-1.6
Mining Equipment etc.	-2.0	-2.0	-1.4	-1.6	-1.3	-1.6
Transmission Equip.	-2.0	-2.0	-1.4	-1.6	-1.3	-1.6
Other Mach. Industry	-2.0	-2.0	-1.4	-1.6	-1.3	-1.6
Other Mach. Equip.	-2.0	-2.0	-1.4	-1.6	-1.3	-1.6
Office Machinery	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Electrical Machinery	-2.0	-2.0	-1.4	-1.6	-1.3	-1.5
Telecom. Equipment	-2.0	-2.0	-1.4	-1.6	-1.3	-1.5
Radio Television	-2.0	-2.0	-1.4	-1.6	-1.3	-1.5
Dom. Electrical Equip.	-2.0	-2.0	-1.4	-1.6	-1.3	-1.5
Vehicles, Engines	-1.8	-1.8	-1.2	-1;4	-1.1	-1.3
Vehicle Bodies	-1.8	-1.8	-1.2	-1.4	-1.1	-1.3
Shipbuilding	-3.2	-3.0	-2.6	-2.8	-2.5	-2.7
Rail Rolling Stock	-3.2	-3.0	-2.6	-2.8	-2.5	-2.7
Cycles, Motorcycles	-3.2	-3.0	-2.6	-2.8	-2.5	-2.7
Aerospace	-3.2	-3.0	-2.6	-2.8	-2.5	-2.7
Optical Photographic	-1.7	-1.6	-1.0	-1.2	-.9	-1.1
Clocks, Watches	-1.7	-1.6	-1.0	-1.2	-.9	-1.1
Vegetable, Animal Oils	-.8	-.6	-1.0	-.9	-.8	-1.1
Meat Preparation	-.8	-.6	-1.0	-.9	-.8	-1.1
Dairy Products	-.8	-.6	-1.0	-.9	-.8	-1.1
Fruit, Veg. Processing	-.8	-.6	-1.0	-.9	-.8	-1.1
Fish Processing	-.8	-.6	-1.0	-.9	-.8	-1.1
Grain Milling	-.8	-.6	-1.0	-.9	-.8	-1.1
Pasta	-.8	-.6	-1.0	-.9	-.8	-1.1
Starch Products	-.8	-.6	-1.0	-.9	-.8	-1.1
Bread, Flour	-.8	-.6	-1.0	-.9	-.8	-1.1
Sugar Refining	-.8	-.6	-1.0	-.9	-.8	-1.1
Cocoa, Choco., Sugar	-.8	-.6	-1.0	-.9	-.8	-1.1
Animal Food	-.8	-.6	-1.0	-.9	-.8	-1.1
Other Food Products	-.8	-.6	-1.0	-.9	-.8	-1.1
Ethyl, Distilling	-.8	-.6	-1.0	-.9	-.8	-1.1
Wine	-.8	-.6	-1.0	-.9	-.8	-1.1
Cider, Perry, Mead	-.8	-.6	-1.0	-.9	-.8	-1.1
Brewing	-.8	-.6	-1.0	-.9	-.8	-1.1
Soft Drinks, Water	-.8	-.6	-1.0	-.9	-.8	-1.1
Tobacco Products	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Manufact. of Leather	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Footwear	-3.2	-1.7	-1.4	-1.0	-1.6	-1.9
Clothing	-3.2	-1.7	-1.4	-1.0	-1.6	-1.9
Household Textiles	-3.2	-1.7	-1.4	-1.0	-1.6	-1.9
Fur Goods	-3.2	-1.7	-1.4	-1.0	-1.6	-1.9
Wooden Furniture	-2.6	-1.3	-1.0	-1.0	-1.1	-1.4
Printing	-2.5	-1.2	-1.0	-1.0	-.9	-1.3
Publishing	-2.5	-1.2	-1.0	-1.0	-.9	-1.3
Rubber Products	-1.5	-2.0	-1.5	-1.0	-1.5	-1.5
Retread, Repair Tyres	-1.5	-2.0	-1.5	-1.0	-1.5	-1.5
Processed Plastics	-1.5	-2.0	-1.5	-1.0	-1.5	-1.5
Jewellery	-2.5	-1.2	-1.0	-1.0	-.9	-1.3
Musical Instruments	-2.5	-1.2	-1.0	-1.0	-.9	-1.3
Photo.Processing	-2.5	-1.2	-1.0	-1.0	-.9	-1.3
Toys, Sports Goods	-2.5	-1.2	-1.0	-1.0	-.9	-1.3
Miscellaneous	-2.5	-1.2	-1.0	-1.0	-.9	-1.3

Source: see text

Table B4: Excess Supply Elasticities, Community and rest of the world, stage 1

	e_c	e_r
Agriculture	5.0	5.0
Oil, Natural Gas	5.0	5.0
Mineral Oil Refining	5.0	5.0
Pharmaceuticals	5.0	5.0
Soap, Detergents	5.0	5.0
Household Chemicals	5.0	5.0
Metal Products	5.0	5.0
Boilermaking	5.0	5.0
Tools, metal Goods	5.0	5.0
Agric. Machinery	6.0	6.0
Machine Tools	6.0	6.0
Textile Machinery	6.0	6.0
Food, Chemical Mach.	6.0	6.0
Mining Equipment etc.	6.0	6.0
Transmission Equip.	6.0	6.0
Other Mach. Industry	6.0	6.0
Other Mach. Equip.	6.0	6.0
Office Machinery	6.0	6.0
Electrical Machinery	6.0	6.0
Telecom. Equipment	6.0	6.0
Radio Television	6.0	6.0
Dom. Electrical Equip.	6.0	6.0
Vehicles, Engines	5.0	5.0
Vehicle Bodies	5.0	5.0
Shipbuilding	5.0	5.0
Rail Rolling Stock	5.0	5.0
Cycles, Motorcycles	5.0	5.0
Aerospace	5.0	5.0
Optical Photographic	5.0	5.0
Clocks, Watches	5.0	5.0
Vegetable, Animal Oils	2.0	.0
Meat Preparation	2.0	.0
Dairy Products	2.0	.0
Fruit, Veg. Processing	2.0	.0
Fish Processing	2.0	.0
Grain Milling	2.0	.0
Pasta	2.0	.0
Starch Products	2.0	.0
Bread, Flour	2.0	.0
Sugar Refining	2.0	.0
Cocoa, Choco., Sugar	2.0	.0
Animal Food	2.0	.0
Other Food Products	2.0	.0
Ethyl, Distilling	5.0	5.0
Wine	5.0	5.0
Cider, Perry, Mead	5.0	5.0
Brewing	5.0	5.0
Soft Drinks, Water	5.0	5.0
Tobacco Products	5.0	.0
Manufact. of Leather	5.0	5.0
Footwear	5.0	5.0
Clothing	5.0	5.0
Household Textiles	5.0	5.0
Fur Goods	5.0	5.0
Wooden Furniture	5.0	5.0
Printing	5.0	5.0
Publishing	5.0	5.0
Rubber Products	5.0	5.0
Retread, Repair Tyres	5.0	5.0
Processed Plastics	5.0	5.0
Jewellery	5.0	5.0
Musical Instruments	5.0	5.0
Photo.Processing	5.0	5.0
Toys, Sports Goods	5.0	5.0
Miscellaneous	5.0	5.0

Source: see text

Table B5: Demand and supply elasticities, stage 2

	e_{cd}	e_{cs}	e_r
Agriculture	-.5	1.5	.0
Solid fuels	-1.0	5.0	6.0
Coke	-1.0	5.0	6.0
Oil, gas, petrol	-1.0	5.0	6.0
Electr.,gas,water	-.5	5.0	6.0
Nuclear fuels	-.5	.0	6.0
Ores, metals	-.5	5.0	6.0
Non-met. minerals	-.5	5.0	6.0
Chemicals	-.5	5.0	6.0
Metal articles	-.5	5.0	6.0
Mechanical engineering	-1.0	5.0	6.0
Office machinery	-1.0	5.0	6.0
Electrical goods	-1.0	5.0	6.0
Motor vehicles	-1.0	5.0	6.0
Other transport	-1.0	5.0	6.0
Meats, preserves	-.5	1.5	.0
Dairy products	-.5	1.5	.0
Other food products	-.5	1.5	.0
Beverages	-.5	1.5	.0
Tobacco products	-.5	1.5	.0
Textiles, clothing	-.9	4.0	6.0
Leather	-.9	4.0	6.0
Timber, furniture	-1.0	4.0	6.0
Paper and products	-1.0	4.0	6.0
Rubber, plastics	-1.0	4.0	6.0
Other manufacturing	-1.0	4.0	6.0
Building, civil engin.	-1.0	4.0	6.0
Wholesale, retail trade	-1.0	4.0	6.0
Lodging, catering	-1.0	4.0	6.0
Inland transport	-.7	5.0	2.0
Sea, air transport	-.5	5.0	2.0
Auxiliary transport	-.5	5.0	6.0
Communications	-.5	5.0	6.0
Credit and insurance	-.5	5.0	6.0
Rent	-.7	5.0	6.0
Other market services	-.2	5.0	.0
Non-market services	-.8	5.0	.0

Source: see text

.../...

Table B6: Common External Tariff by sector, stage 1

	CET (%)
Agriculture	.0
Oil, Natural Gas	.0
Mineral Oil Refining	.0
Pharmaceuticals	6.5
Soap, Detergents	6.4
Household Chemicals	6.7
Metal Products	5.6
Boilermaking	5.7
Tools, metal Goods	5.2
	4.1
Agric. Machinery	4.1
Machine Tools	4.1
Textile Machinery	4.1
Food, Chemical Mach.	4.1
Mining Equipment etc.	4.1
Transmission Equip.	4.1
Other Mach. Industry	4.1
Other Mach. Equip.	4.1
Office Machinery	4.8
Electrical Machinery	5.5
Telecom. Equipment	5.5
Radio Television	5.5
Dom. Electrical Equip.	5.5
Vehicles, Engines	6.5
Vehicle Bodies	6.5
Shipbuilding	6.5
Rail Rolling Stock	6.5
Cycles, Motorcycles	6.5
Aerospace	6.5
Optical Photographic	5.6
Clocks, Watches	5.6
Vegetable, Animal Oils	15.0
Meat Preparation	20.0
Dairy Products	20.0
Fruit, Veg. Processing	7.0
Fish Processing	13.0
Grain Milling	.0
Pasta	15.0
Starch Products	15.0
Bread, Flour	20.0
Sugar Refining	80.0
Cocoa, Choco., Sugar	10.0
Animal Food	.0
Other Food Products	10.0
Ethyl, Distilling	15.0
Wine	10.0
Cider, Perry, Mead	.0
Brewing	24.0
Soft Drinks, Water	10.0
Tobacco Products	30.0
Manufact. of Leather	7.6
Footwear	10.0
Clothing	12.5
Household Textiles	10.2
Fur Goods	5.6
Wooden Furniture	5.2
Printing	2.7
Publishing	2.7
Rubber Products	6.3
Retread, Repair Tyres	4.0
Processed Plastics	8.0
Jewellery	4.0
Musical Instruments	5.4
Photo.Processing	5.6
Toys, Sports Goods	6.1
Miscellaneous	5.5

Source: see text.

Table B7: Common External Tariff by sector, stage 2

	CET (%)
Agriculture	.0
Solid fuels	.0
Coke	.0
Oil, gas, petrol	.0
Electr.,gas,water	.0
Nuclear fuels	.0
Ores, metals	3.0
Non-met. minerals	5.0
Chemicals	6.5
Metal articles	5.3
Mechanical engineering	4.1
Office machinery	5.0
Electrical goods	5.5
Motor vehicles	6.5
Other transport	6.5
Meats, preserves	20.0
Dairy products	20.0
Other food products	16.5
Beverages	30.0
Tobacco products	30.0
Textiles, clothing	10.0
Leather	7.5
Timber, furniture	4.8
Paper and products	5.5
Rubber, plastics	6.1
Other manufacturing	5.3
Building, civil engin.	.0
Wholesale, retail trade	.0
Lodging, catering	.0
Inland transport	.0
Sea, air transport	.0
Auxiliary transport	.0
Communications	.0
Credit and insurance	.0
Rent	.0
Other market services	.0
Non-market services	.0

Source: see text.

Annex C

Algebraic details of Method

C1 Stage 1

Figure C1 summarises the model for the stage 1 calculations. It is identical to figure 2 in Section 2 except that the excess supply curve of the rest of the world, ER, has shifted down by a fraction, d, of the downward shift in the rest of the Community excess supply curve EC. This reflects the extent to which non-Community suppliers can also take advantage of harmonised or mutually recognised standards. Note that R would enjoy producer surplus gains if the displacement from ER to ER' was large enough for ER' to cut the new price line P' to the right of M_r.

Net welfare gain to country I equals C + D - H + J and net welfare gain to C equals E + F. Therefore, the total Community welfare gain equals C + D + E + F - H + J. Welfare loss in rest of the world equals N + K.

Using the following definitions:

p = proportionate change in I's import price, (P'-P)/P; (this will be negative).

p_r = proportionate change in ROW's export price, $(P_r'-P_r)/P_r$; (this will be negative).

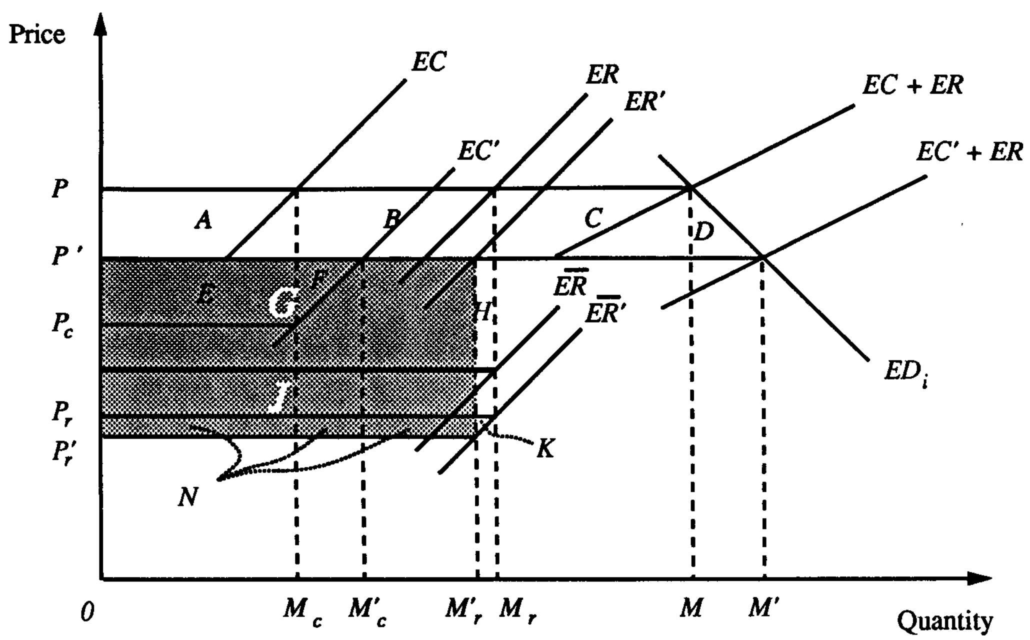
p_c = proportionate change in C's export price, net of NTB costs, $(P'-P_c)/P_c$ (will be positive).

s_r = initial share of ROW in I's imports, M_r/M.

s_c = initial share of C in I's imports, M_c/M.

.../...

Figure C1



m = proportionate change in I's imports, (M'-M)/M.

m_r = proportionate change in I's imports from ROW, (MR'-MR)/MR (negative).

m_c = proportionate change in I's imports from C, (MC'-MC)/MC (positive).

b = the proportionate change (reduction) in costs in the Community due to the removal of NTBs, $(P-P_c)/P$ (will be positive). This change corresponds to the potential cost reductions which are given by the internal market studies. It is defined as above in order that $P/P_c = 1/(1-b)$.

.../...

t = the proportionate tariff rate (positive) on imports from ROW, $(P-P_r)/P_r$ or $(P'-P_r')/P_r'$.

m_d = $m_r \cdot s_r$ which is a measure of trade diversion, note that $m = m_r \cdot s_r + m_c \cdot s_c$.

n = import elasticity of demand in the home country.

e_r = export supply elasticity for ROW.

e_c = export supply elasticity for the Community.

Then

$$
\begin{aligned}
C &= -p \cdot s_c \\
D &= -(p \cdot m)/2 \\
E &= p_c \cdot s_c(1-b) \\
F &= p_c(1-b)m_c \cdot s_c/2 \\
H &= m_d\ (t/(1+t) + p) \\
J &= -p(s_r+m_d)/(1+t) \\
K &= -p_r \cdot m_d/2(1+t) \\
N &= -p_r(s_r+m_d)/(1+t).
\end{aligned}
$$

All effects are expressed as proportions of the total value of initial imports, M.P.

To calculate C, D, E, F, J, K, H, N it is necessary to have expressions for p, p_r, p_c, m, m_r, m_c in terms of known quantities s_r, s_c, t, b, n, e_r, e_c where n, e_r and e_c are the elasticities defined above.

By definition

$$
\begin{aligned}
m &= n \cdot p \\
m_r &= e_r \cdot p_r \\
m_c &= e_c \cdot p_c \\
m &= m_c s_c + m_r s_r
\end{aligned}
$$

Now, $p_c = p + b$, approximately.

.../...

and, $p_r = p + db \quad (-p = db - p_r)$

producing $p = \dfrac{-b(e_c s_c + d e_r s_r)}{e_c s_c + e_r s_r - n}$ (less than or equal to zero)

and $p_c = \dfrac{b((1-d)e_r s_r - n)}{e_c s_c + e_r s_r - n}$ (greater than or equal to zero)

If $d = 0$, the expressions for p and p_c reduce to $\dfrac{-b(e_c s_c)}{e_c s_c + e_r s_r - n}$

and $\dfrac{b(e_r s_r - n)}{e_c s_c + e_r s_r - n}$, respectively

Note that $p_r = \dfrac{b(e_c s_c(d-1) - nd)}{e_c s_c + e_r s_r - n}$ (is greater than zero if nd is less than $e_c s_c$ (d-1))

Then the fall in price P to P' (measured by p) will be greater the larger is b, the proportionate reduction in costs in the Community, $e_c s_c$ and the smaller is $e_r s_r$ and n. The maximum value n can take (assuming a non-inferior good) is zero, in this case $m_c s_c = -m_r s_r$.

Re-writing the expressions for A to N in terms of known parameters,

C $= - p.s_c.$

D $= -(n.p^2)/2$

E $= p_c.s_c\ (1-b)$

F $= p_c^2\ (1-b).\ e_c.s_c/2$

H $= s_r.e_r.p_r(t/(1+t) + p)$

J $= - p.s_r\ (1 + e_r.p_r)/(1+t)$

K $= - p_r^2.e_r.s_r/2\ (1 + t)$

N $= - p_r s_r(1 + e_r.p_r)/(1+t)$

.../...

C.2 Stage 2

The model for stage 2 is summarised in Figure C2.

Net welfare gain to the Community equals C + D + E + F - H + J. Welfare loss in the rest of the world equals J + K.

Using the following definitions:

c	$= (C'-C)/C$,	proportionate change in apparent consumption
m	$= (M'-M)/M$,	proportionate change in extra-EC imports
y	$= (Y'-Y)/Y$	proportionate change in apparent production
p	$= (P'-P)/P$,	proportionate change in price of EC consumption, negative
p_c	$= (P'-P_c)/Pc$	proportionate change in EC export or supply price, positive
p_r	$= (P_r'-P_r)/P_r$	proportionate change in rest of world export price
w	$= (P-P_c)/P$,	proportionate cost reduction in EC

s_y = Y/C, share of EC production in apparent consumption

s_m = M/C, share of imports in apparent consumption

e_r = export supply elasticity for rest of world

e_{cs} = supply elasticity for Community

e_{cd} = demand elasticity for Community

By definition,

$c = e_{cd} \cdot p$

$m = e_r \cdot p_r$

$y = e_{cs} \cdot p_c$

Now $p_c = p + w$, approximately and $p_r = p$

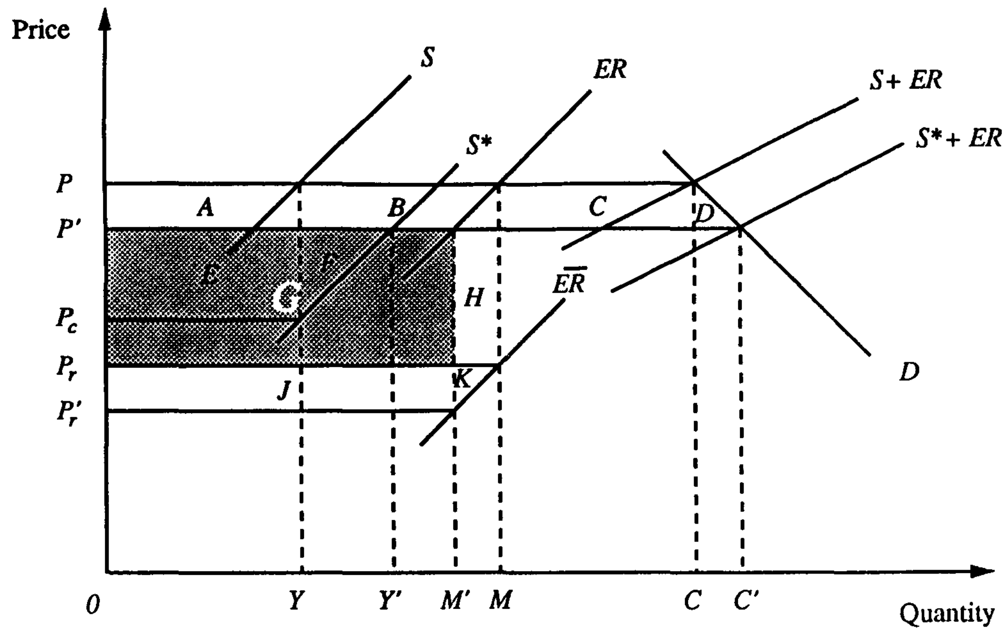
Therefore, $p = \dfrac{-w\,(s_y \cdot e_{cs})}{s_y \cdot e_{cs} + s_m \cdot e_r - e_{cd}}$

and $p_c = \dfrac{w(s_m \cdot e_r - e_{cd}}{s_y \cdot e_{cs} + s_m \cdot e_r - e_{cd}}$

$p_r = p$

.../...

<u>Figure C2</u>



Note : OY + OM = OC
OY' + OM' = OC'

The areas are defined as follows:

C $= - p(1 - s_m)$

D $= - e_{cd} \cdot p^2/2$

E $= p_c \cdot s_y(1-w)$

F $= p_c{}^2 \cdot (1-w)\ e_{cs} \cdot s_y/2$

H $= s_m \cdot e_r \cdot p_r((t/1+t) + p)$

J $= - p \cdot s_m(1+e_r \cdot p_r)/(1+t)$

K $= s_m \cdot e_r \cdot p^2/2(1+t)$, where $p_r = p$.

All welfare changes are expressed as a proportion of the initial level of apparent consumption.

.../...

C.3 Stage 3

The model for stage 3 is summarised in figure C3.

An increase in output is associated with a decrease in unit cost. This parameter on a sector by sector basis is derived from Pratten (1987) in the fashion described below.

The welfare gain from the unit cost decrease is given by areas A and B.

$= (P'-P)/P \,.\, (Q + (Q' - Q)/2)/Q$ as a proportion of initial production.
$= p.\ (1 + q/2)$

where p = proportionate change in unit cost
q = proportionate change in output.

For a cost function of the following form

$$\log C = a + b \log Y$$

average cost = a Y^b, marginal cost = $(1 + b)\ aY^b$

The ratio of unit cost at half of minimum efficient scale (MES) relative to unit cost at MES is, therefore, given by

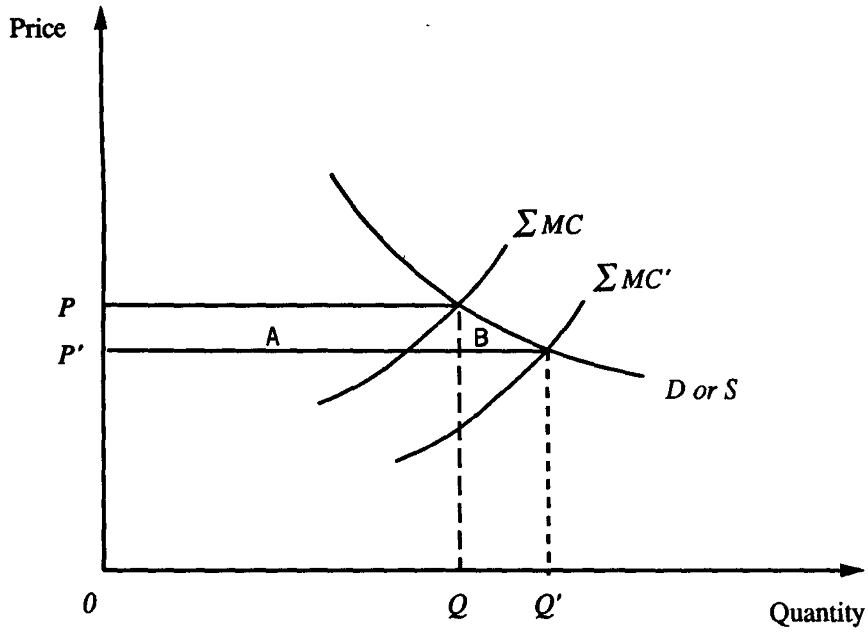
$$\text{AC (half of MES)/AC(MES)} = \frac{(Y_{MES}/2)^b}{Y_{MES}^{\ b}}$$

It is therefore possible to calculate the parameter, b, which links changes in unit cost and changes in output. These parameters are given in Table A6.

One problem associated with stage 3 is that it assumes that extra output is spread evenly across existing Community plants. There is no consideration, therefore, of the trade effects either within the Community or with the rest of the world.

.../...

Figure C3



Σ MC is a quasi-supply schedule.
Essentially industry moves from P, Q to P', Q'.

Annex D

List of Studies

Studies concerning specific types of barrier

1. "The Cost of Non-Europe: Border related controls and Administrative Formalities"
   Ernst & Whinney

2. "The Cost of Non-Europe: Technical Barriers in the EC: An illustration by six industries"
   Groupe MAC

3. "The Cost of Non-Europe: Some case studies on technical barriers"
   Gewiplan

4. "The Cost of Non-Europe in Public Sector Procurement"
   W.S. Atkins Management Consultants

5. "The cost of Non-Europe: Obstacles to Trans-Border Business Activity"
   European Research Associates, PROGNOS

Studies concerning specific industries

6. "The Cost of Non-Europe in the Foodstuffs Industry"
   Groupe MAC

7. "The Cost of Non-Europe in the Pharmaceutical Industry"
   Economists Advisory Group

8. "The EC 92 Automobile Sector"
   Ludwigsen Associates Limited

9 "The Cost of Non-Europe in the Textile-Clothing Industry"
   IFO-Institut für Wirtschaftsforschung, and Prometeia Calcolo Srl.

10. "Le coût de la Non-Europe des produits de construction"
   BIPE - Bureau d'informations et de prévisions économiques

11. "The benefits of Completing the Internal Market for Telecommunications Equipment in the Community"
   J. Müller, INSEAD

Studies concerning specific service sectors

12. "The Cost of Non-Europe in Financial Services"
   Price Waterhouse Economic and Management Consultants

13. "The Cost of Non-Europe for Business Services"
   Peat, Marwick, McLintock

.../...

14. "The Cost of Non-Europe: An illustration in the road-haulage sector"
Ernst & Whinney

15. "The Benefits of Completing the Internal Market for Telecommunications Services in the Community"
J. Müller, INSEAD.

Studies based on particular analytical approaches

16. "The Completion of the Internal Market: a Survey of European Industry's Perception of the Likely Effects"
G. Nerb, Directorate General for Economic and Financial Affairs, Commission of the European Communities.

17. "A Survey of the Economies of Scale"
C. Pratten, Department of Applied Economics, University of Cambridge.

18. "Economies of Scale and Intra-Community Trade"
J. Schwalbach, International Institute for Management

19. "Economies of Scale and the Integration of the European Economy: The Case of Italy"
R. Helg, P. Ranci, Istituto per la Ricerca Sociale

20. "Competition and Innovation"
P. Geroski, University of Southampton and Centre for Business Strategy, London Business School.

21. "The Costs of Non-Europe: An Assessment based on a Formal Model of Imperfect Competition and Economies of Scale"
A. Smith, University of Southampton, and A. Venables, University of Sussex.

22. "Partial Equilibrium Calculations of the Impact of Internal Market Barriers in the European Community"
M. Davenport; and R. Cawley, Directorate General for Economic and Financial Affairs, Commission of the European Communities.

23. "Conséquences macroéconomiques de l'achèvement du marché intérieur - l'enseignement des modèles"
M. Catinat, E. Donni, A. Italianer, Directorate General for Economic and Financial Affairs, Commission of the European Communities.

24. "The Internal Markets of North America: Fragmentation and Integration in the US and Canada"
J. Pelkmans, European Institute of Public Administration.

9.1

CHAPTER 9

Evaluation des économies d'échelle pouvant résulter de l'achèvement du marché intérieur

Michel Aujean, European Commission

9.2

Ce court chapitre traite des bénéfices qui pourraient résulter de l'exploitation des économies d'échelle dans un marché communautaire intégré. Il présente la méthodologie permettant d'établir un lien entre les mécanismes décrits dans les chapitres 1 à 4 de ce volume et les estimations des gains en bien-être provenant des économies d'échelle provenant de restructuration.

L'évaluation des effets de taille résultant de l'intégration des marchés, et plus particulièrement des économies d'échelle provenant de la restructuration des activités productives, constitue tant sur le plan méthodologique que du point de vue quantitatif une opération d'une grande difficulté. En dépit des études disponibles à cet effet, les estimations qui ont été réalisées demeurent incertaines, même si leur ordre de grandeur paraît généralement accepté par les différents experts qui ont été associés à ces travaux.

L'estimation qui est fournie dans le rapport "1992: la nouvelle économie européenne" ne vise en fait à quantifier que les seules économies d'échelle réalisables au niveau des unités de production dans l'industrie et dans une partie du secteur énergétique de la Communauté, après restructuration des unités de production et exploitation de la dimension européenne. En effet, même si la notion traditionnelle d'économies d'échelle tend à être remise en cause avec l'introduction des nouvelles technologies, il n'en demeure pas moins que la structure par taille de l'industrie européenne apparaît encore, du fait de sa fragmentation, largement sous-optimale. Cette approche restrictive a plusieurs raisons:

- des économies d'échelle statiques en amont (R et D par exemple) ou en aval (distribution - marketing) du stade de la production proprement dite sont particulièrement difficiles à mettre en évidence. Il en est de même d'une façon générale dans les services[1] pour lesquels aucune économie d'échelle n'a donc été évaluée, ce qui constitue certainement une sousestimation.

- ni les économies d'échelle dynamiques (effets d'apprentissage ou d'expérience), ni les économies de gamme n'ont pu, faute d'informations et de méthodes d'évaluation, être prises en considération.

- les économies d'échelle résultant directement d'un accroissement de la production ont été évaluées indépendamment; elles sont d'ailleurs d'une ampleur très modeste.

La méthode de calcul repose en fait sur l'utilisation et la combinaison de plusieurs sources et approches. Les calculs ont été effectués au niveau de désagrégation sectorielle le plus fin pour lequel des informations statistiques étaient disponibles au niveau communautaire c'est-à-dire la classification NACE à trois chiffres - la liste des secteurs est jointe en annexe. A ce niveau de désagrégation, ont été considérés les secteurs d'activité pour lesquels l'inventaire dressé par Pratten (1987) montrait qu'existait in abstracto un potentiel significatif d'économies d'échelle:

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[1] Voir à ce sujet les arguments présentés dans la section 6.1 du rapport "1992: la nouvelle économie européenne", Economie Européenne N° 35.

soit que la taille minimale soit élevée par rapport à la dimension des plus grands marchés nationaux, soit que la pente des coûts en fonction de la taille soit particulièrement forte. En outre, certains secteurs d'activité ont également été pris en compte parce que des études sectorielles spécifiques sur ces secteurs avaient été entreprises par les consultants et fournissaient d'emblée des estimations de baisses des coûts après restructuation. Au total les secteurs ainsi retenus (cf. tableau 1) représentent environ 28% de la valeur de la production totale de la Communauté à douze en 1985.

L'approche proposée par Müller et Owen (1985) a très largement guidé les travaux qui ont été effectués et en particulier les études de J. Schwalbach (1988) et de Helg et Ranci (1988). La logique économique qui soustend le processus de restructuration repose sur le fait que le développement du commerce international donne accès pour les plus compétitifs (sous entendu: les plus grands) à un plus grand nombre d'opportunités de remplacer les producteurs plus petits, donc moins efficaces et à prix plus élevés, à la fois sur le marché domestique et sur le marché extérieur. Sur le plan empirique des travaux économétriques ont été conduits par J. Schwalbach (1988) et par Helg et Ranci (1988) afin d'expliquer, pour un ensemble de secteurs, l'écart entre la taille moyenne des unités de production et la taille minimum techniquement efficace en fonction de l'importance des échanges extérieurs et du potentiel d'économies d'échelle. Ces travaux confirment dans leur ensemble les relations établies entre développement du commerce, augmentation de la taille des unités de production et gains d'efficacité technique (baisses de coûts dues aux économies d'échelle).

La liste des secteurs traités dans ces études (14 pour l'Italie, 20 pour l'Allemagne et 19 pour le Royaume-Uni) est un peu moins large que celle retenue pour la présente évaluation (elle couvre environ de 12 à 20% de la production totale selon le pays) mais très voisine dans sa nature. Il ressort de ces études que, pour les secteurs considérés:

- il existe un potentiel considérable de gains d'efficacité tchnique du fait de la taille moyenne trop réduite des unités de production. Les surcoûts évalués pour l'ensemble de ces secteurs sont, en 1982-83 de 15% en Allemagne, 23% en Italie et 25% au Royaume Uni.

- la relation avec le développement du commerce extérieur est telle que, dans le cas de l'Allemagne par exemple, un doublement simultané des exportations et des importations impliquerait, dans l'hypothèse d'une consommation domestique totale inchangée, un accroissement de 110% de la taille moyenne des unités de production et, de ce fait, une réduction de plus de moitié du surcoût qui serait ramené de 15 à environ 7%.

A défaut de pouvoir disposer d'un modèle permettant d'estimer directement l'effet de l'intégration des marchés sur la taille des unités de production ou sur le développement du commerce, l'évaluation du phénomène d'économies d'échelle a reposé en premier lieu sur l'exploitation des études sectorielles effectuées par les consultants. Ainsi un certain nombre de secteurs dans lesquels d'importantes restructurations pourraient prendre place avec l'achèvement du marché intérieur font apparaître avec l'accroissement de la taille des unités de production - lié aux rationalisations - des baisses de coûts souvent fort appréciables. Ces baisses concernent les secteurs suivants: (24) Minéraux non métalliques, (257) Produits pharmaceutiques, (315) Chaudronnerie, (33) Machines de bureau, (342) Matériel électrique d'équipement, (344) Matériel de télécommunications, (351) Automobiles, (362) Matériel ferroviaire, (364) Avions etc..., (41-42) Produits alimentaires, (43-45) Textile habillement. En moyenne les résultats avancés par les consultants montrent qu'un accroissement de taille de l'ordre de 25% résulterait de l'achèvement du marché intérieur.

L'accroissement de taille ainsi évalué par secteur a ensuite été appliqué aux paramètres de taille et de coûts recensés par Pratten dans son survey afin d'en déduire les réductions de coûts. L'ensemble des informations de base utilisées pour le calcul sont rassemblées dans le tableau 1 qui donne:

1. le secteur et son code NACE

2. la part du secteur dans la production totale de EUR 12 en 1985 (celle-ci étant évaluée à 6037 milliards d'écus)

3. le surcoût pour une taille égale à la moitié de la taille minimum techniquement efficace (METS)

4. l'évaluation des économies d'échelle, exprimées en % du coût moyen total de production, telle qu'elle résulte de l'application d'une fonction de coût logarithmique[1].

---

[1] Soit une fonction de coût moyen total (CMT) du type Log CMT = a + b Log T avec T = taille moyenne des unités de production dans un secteur.
Afin d'évaluer le surcoût de production lorsque la taille T est inférieure à la taille minimum techniquement efficace (METS), il faut calculer le surcoût s tel que

$$CMT_1 = CMT_0\ (1 + s)$$

avec $\text{Log } CMT_0 = a + b \text{ Log (METS)}$

et $\text{Log } CMT_1 = a + b \text{ Log } T$

Connaissant le surcoût lié à une taille égale à la moitié de la taille minimum METS ($T = \frac{METS}{2}$) on peut définir b qui exprime le lien entre taille et surcoût:

$$b = \frac{\text{Log (1 + surcoût à 1/2 METS)}}{\text{Log } 1/2}$$

(suite au bas de la page 5)

Les résultats sectoriels ainsi obtenus représentent une économie de coûts de 2.45% en moyenne pour les secteurs étudiés, soit encore 1.5% du total de la production des secteurs industrie et énergie ou 0.68% de la valeur totale de la production de EUR 12.

Pour les besoins des estimations effectuées dans l'évaluation économique d'ensemble, ces résultats ont été agrégés au niveau de la classification R44 (cf. tableau 2). Par la suite ces baisses de coûts dont une partie concerne des secteurs de biens de consommation intermédiaire, ont été transférées et amplifiées au travers des tableaux entrées-sorties afin d'être affectées aux secteurs utilisateurs qui bénéficieront en définitive de ces réductions de coûts. Les résultats en termes de gains de bien-être sont présentés dans le tableau 2.

Le calcul des gains en bien-être repose sur la méthode décrite dans l'annexe 3C du chapitre 8 de ce volume. Les gains globaux en bien-être s'élèvent à 56 milliards d'Ecus aux prix de 85 pour EUR 7 ou environ 1,9% du PNB.

---

1 (Suite)

Le surcoût (1 + s) pour une taille quelconque T inférieure à METS s'écrit alors

$$1 + s = e^{b \operatorname{Log} \frac{T}{METS}}$$

Par exemple pour la branche 344 Matériel de télécommunications:

T = 69% de la MES et surcoût à 1/2 METS = 10%

$$b = \frac{\operatorname{Log}(1 + 0.1)}{\operatorname{Log} 1/2} = -0.1375$$

$$1 + s = e^{-0.1375 \operatorname{Log} 0.69} = 1.052$$

le surcoût est donc de 5.2%

9.6

Tableau 1: Eléments du calcul des économies d'échelle

Code NACE	(1) Nom du secteur	(2) Part dans production de EUR-12 en %	(3) Surcoût pour une taille égale à 1/2 MES en %	(4) Economies d'échelle dues à des restructurations (baisses des coûts) en %
14	Raffinage de pétrole	3.5	4	-0.57
221	Sidérurgie	1.67	6	-1.25
224	Métaux non ferreux	0.78	8	-1.18
24	Minéraux non métalliques	1.58	10	-2.26
251	Chimie de base	2.14	8	-3.40
255	Peintures, vernis...	0.33	3	-1.00
257	Produits pharmaceutiques	0.62	12	-4.01
26	Fibres synthétiques	0.13	7	-3.26
311	Fonderies	0.33	10	-2.73
315	Chaudronnerie	0.37	20	-12.93
321	Machines agricoles	0.28	6	-5.34
322	Machines-outils	0.26	6	-2.93
324	Machines ind. agro-alimentaires	0.35	6	-2.92
325	Machines mines génie civil	0.58	6	-4.28
33	Machines de bureau	0.56	6	-3.34
342	Matériel électrique équipement	0.90	10	-3.05
344	Matériel de telecommunications	0.83	10	-5.20
345	App. radio, TV, Hifi	0.50	7	-1.30
346	App. électrodomestiques	0.27	8	-2.00
351	Automobiles	2.09	9	-2.65
362	Matériel ferroviaire	0.07	20	-14.64
363	Cycles motocyles	0.05	4	-1.53
364	Avions, hélicoptères	0.40	20	-6.19
372	Mat. médico-chirurgical	0.06	10	-2.93
41/42	Produits alimentaires	6.95	6	-1.53
43/45	Textile-habillement	2.91	2	-0.38
47	Papier imprimerie	2.44	8	-1.82
481	Caoutchouc, plastiques	1.25	5	-1.66
		27.8%		

9.7

Tableau 2: Les économies d'échelles dues à des restructurations: résultats

	Paramètres de réduction des coûts de production	Gains de bien-être provenant des économies d'échelle (en milliards d'écus)
Agriculture	0	1,1
Combustibles solides	0	0,2
Coke	0	0,0
Hydrocarbures	0,6	1,4
Electricité, gaz, eau	0	0,6
Combustibles nucléaires	0	0,0
Minerais, métaux	1,0	2,5
Minerais non métalliques	2,3	1,9
Produits chimiques	2,6	7,3
Produits métaux	2,2	3,2
Construction mécanique	2,0	3,8
Matériel de bureau	2,5	1,3
Matériel éléctrique	3,0	4,9
Véhicules automobiles	2,2	4,1
Autres moyens de transp.	5,8	2,5
Viande, conserves	1,6	0,9
Produits laitiers	1,6	1,1
Autres prod.alimentaires	1,6	3,0
Boissons	1,6	0,9
Produits à base de tabac	1,6	0,5
Textiles, habillement	0	0,5
Cuir	0,4	0,2
Bois, meubles	0	0,3
Papier, art. en papier	1,8	2,8
Caoutchouc, plastique	1,7	1,6
Autres prod.manufacturés	0	0,1
Bâtiment, génie civil	0	2,2
Commerce,gros et détail		1,5
Logement, restauration		0,9
Transports intérieurs		0,3
Transp.maritime, aérien		0,3
Transports auxiliaires		0,1
Communications		0,1
Crédit et assurance		1,1
Loyers		0,2
Autres services marchand		0,5
Services non marchands		2,4
Total (moyenne)		56,4

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CHAPTER 10

The completion of the internal market: results of macroeconomic model simulations[1]

by

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Commission of the European Communities

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INTRODUCTION

The analysis presented in this article forms part of the research project on the "Costs of Non-Europe" which was chaired by Mr. Paolo Cecchini. The project as a whole included the reports of some thirty consultancy firms and economic research institutes in several countries, a survey of some 11 000 firms[1] and a wide-ranging comparison of prices between Member States. The purpose of the present article is to describe the gains which may be expected from completing the internal market in terms of macroeconomic aggregates: consequences for GDP, employment or inflation, and impacts on the key macroeconomic equilibria such as budget or external balances.

Complementary to the preceding article ("Partial equilibrium calculations of the impact of internal market barriers in the European Community") it synthesises the primary effects quantified by the various external consultants and institutes on the partial areas covered by their analyses, and also takes account of the repercussions between partial effects through macroeconomic interrelationships.

The methodology for quantifying the macroeconomic consequences is complex; it is described first (section 1). The article goes on to present the macroeconomic impacts for four large areas: the abolition of customs controls, the opening up of public procurement, the liberalization of financial services and capital movements, and the "supply effects" (sections 2 to 5 respectively). The final section is devoted to the overall analysis of the consequences of the large internal market. The geographical coverage is chiefly the Community as a whole. However, when information was available, the analysis also made it possible to analyse the macroeconomic consequences country by country, in particular for the Federal Republic of Germany, France, Italy and the United Kingdom.

1 These reports or a summary of them are published in this or other volumes of the Document Series.

1. METHODOLOGY

The macroeconomic assessment of completing the internal market which is presented here is based on simulations made with the help of macroeconometric models.

They have been used under rather special circumstances, since, because of the way in which they are constructed, these models cannot describe in an endogenous manner all the consequences of measures such as those covered by the White Paper programme. It was therefore decided to proceed in two stages: firstly the studies made by various external consultants commissioned for the requirements of the research on the cost on non-Europe were used to assess quantitatively the primary effects of completion of the large internal market on the partial fields covered by each of those studies (see Annex 5 for list of studies used). Secondly, these effects assessed "upstream" from the models were fed into the latter, thereby inducing certain changes in mechanisms or behaviour. In this way, the inability of the econometric models to describe the primary effects was circumvented. On the other hand, full use was made of their ability to simulate secondary effects - i.e. the usual macroeconomic mechanisms (multiplier and accelerator effects, income-sharing effects, price competitiveness effects, inflation mechanisms, capital accumulation, growth potential, etc.), and their transmission from one country to another through international trade or movements in exchange rates.

The introduction of the primary effects into the models is presented extensively in Catinat and Italianer (1988). This paper summarises only briefly each of the shocks (see Annex 1 for a list of the main shocks).

The macroeconomic simulations made are "scenarios" in the sense that the consequences described are conditioned by the primary "shocks" quantified "upstream" from the models. Only the macroeconomic feedback effects are simulated, and in particular the effects on the easing of various macroeconomic constraints (improvement in budgetary and external deficits, reduction in inflationary dangers). Being scenarios, the simulations thus describe potentialities, i.e. likely macroeconomic effects if the White Paper proposals are implemented completely. Furthermore, the results of these scenarios should be considered as lying in the middle of a range which is defined by a margin of uncertainty of +/- 30%. This range results from the aggregation of the uncertainty ranges on each of the primary shocks as derived from the consultancy studies, cf. Catinat and Italianer (1988).

Despite the methodology used and the precautions taken, the results provided by the models are likely to err on the side of conservatism: because of the model design, past behaviour as reflected in behavioural equations is assumed to continue and structural effects are poorly represented. The simulated consequences should therefore be regarded as covering the medium/long term (five to ten years). Beyond that time horizon, the structural changes should be analyzed more precisely.

Two econometric models were used: the Commission's HERMES model and the OECD's INTERLINK model, used on the Commission's sole responsability. The fact that they are complementary made it possible to explore the principal effects which may be expected. Their characteristics and their dynamic or variant properties are analyzed in detail in Valette and Zagamé (1988) and Richardson (1987) respectively.

.../...

The analysis first proceeds with the identification of four areas: the elimination of frontier controls, the opening up of public procurement, the liberalization of financial services and capital movements, and what is called the "supply effects", i.e. the strategic reactions of firms faced with a new economic and financial environment. These areas are defined on the basis of economic criteria (Catinat (1988)) and are distinct from the classification used in the White Paper which mentions three kinds of barrier: physical barriers, technical barriers and fiscal barriers. The four areas in fact cover the physical and technical kinds of barrier only; the proposals for removing fiscal barriers are presented eleswhere (Commission of the EC (1987)), and will not be reexamined here.

These four areas are sufficiently "separable" for each of them to be analysed in turn: the macroeconomic consequences which they induce have their own logic and dynamic. The impacts of these four areas, defined and simulated so as to be independent[1], are then combined to provide an overall assessment of the gains which can be expected from the completion of the internal market. The structure of this article follows the same approach: the consequences of completing the internal market are first analysed area by area (Sections 2 to 5), then globally (Section 6).

For each of the four fields analysed, the discussion first concentrates on a description of the macroeconomic consequences for the Community as a whole. Subsequently, a comparison of the impacts on a country-by-country basis is attempted. But before taking a look at the individual country results, a word of caution concerning their interpretation seems necessary and should be kept in mind. The individual country results are substantially influenced not only by uncertainty surrounding the model inputs, but also by the specifications of the country models used for simulation. The same model input for one country would, if inserted into another country model, almost certainly produce a different outcome. As far as differences in models account for differences in country specificities this is justified, but what if models reflect a different theoretical stance? The HERMES model clearly incorporates such cases as the latter. For some countries (e.g. Belgium, France, Italy, United Kingdom) the models are macrosectoral, but for others, in particular for Germany, the model is macroeconomic[2]. The Interlink model also incorporates such cases. The supply blocks of the models for the larger countries (Germany, France, Italy, the United Kingdom) are more developed than those for the others, for instance. Therefore, where the Community result may be interpreted as a sample mean which is more or less unbiased, the individual results may not be entirely comparable.

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[1] In particular, due care has been taken, in running the simulations, to avoid double counting.

[2] Updated national blocks of the Comet IV models have been used and linked with the others when the national blocks of the Hermes model were not yet available.

.../...

Some basic assumptions were made for all the simulations, except when stated otherwise:

- nominal exchange rates are unchanged (i.e. they have the same evolution over time as in the baseline)
- real government expenditures are unchanged (consumption and investment)
- real interest rates are unchanged ex post (accommodation of the real money stock)
- it was assumed that all political and legislative measures needed to implement the internal market were taken in one particular year within the 1988-1992 period. Furthermore, the static reactions of economic agents were taken to be immediate (e.g. the reduction of intra-Community transport costs after the removal of customs controls), while the dynamic effects were spread out over a five-year period (e.g. the exploitation of economies of scale in the integrated market). Together, these assumptions amount to an acceleration of the implementation and consequences of the White Paper proposals. Consequently, the "medium term" effects which result technically from a simulation over 6 years, should in reality be extended to the medium/long run (approximately 10 years).

All the simulations were performed in a linked mode, which means endogenous and coherent changes in the trade of goods and services, factor income and capital flows[1]. Table 1.1 gives per area an overview of which models were given shocks for the simulations.

[1] Trade in services, factor income and and capital flows were treated coherently in the Interlink model only

.../...

Table 1.1
Overview of the models which were given shocks for simulations of the internal market

Area	B	D	E	F	I	NL	UK	% 1985 EUR12 GDP
1. Customs barriers	HERMES	Comet	—	HERMES	HERMES	Comet	HERMES	88%
2. Public markets	HERMES	Comet	—	HERMES	HERMES	—	HERMES	83%
3. Financial services	Interlink	Interlink	Interlink	Interlink	Interlink	Interlink	Interlink	95%
4. Supply effects	—	Comet	—	HERMES	HERMES	—	HERMES	80%

Note: These models have all been simulated in linked mode. If a particular model of the linked HERMES or Interlink systems was not given a shock (mostly due to lack of information), this still implied that the reactions in such a model upon the shocks in other countries were endogenous.

.../...

2. THE ELIMINATION OF CUSTOMS CONTROLS

The first stage in the integration of the Community market is the elimination of customs controls. The consequences will be psychological (evidence of the irreversibility of the process, firms' expectations) as much as economic. Without ignoring the importance of the first aspect, we shall concentrate chiefly on the second.

2.1 Simulation characteristics

The existence of intra-Community frontiers gives rise to two types of costs:

- delays at customs and especially the administrative formalities of customs clearance are estimated to cost between 7,9 and 8,3 billion ECU in 1987 (0,23 and 0,24% of Community GDP), the administrative cost being partly borne by exporting firms and partly paid to customs agents;

- the employment of customs officials at intra-Community frontiers: the cost to governments is estimated at between 0,5 and 1 billion ECU in 1987 (0,02 to 0,03% of Community GDP).

The removal of intra-Community frontiers would have as a direct result a reduction in the price of intra-Community trade, since the extra costs of delays or administrative formalities are paid either directly or indirectly by importing firms. The consultant Ernst & Whinney has estimated the direct costs of customs formalities for intra-Community trade in goods as given in Table 2.1.

Table 2.1 Direct cost of customs formalities for intra-Community trade in goods (billion ECU in 1987)

Administrative costs for firms	
-internal	5,9
-external	1,6
-total	7,5
Costs associated with frontier delays for firms	0,4 to 0,8
Total costs for firms[1]	7,9 to 8,3
Administrative costs for public authorities[2]	0,5 to 1,0
Total costs of customs formalities	8,4 to 9,3

Source: Ernst & Whinney
[1] i.e. between 1,6 and 1,7% of total intra-Community trade
[2] i.e. between 0,3 and 0,6% of the average public deficit in 1987

.../...

Additional information was available concerning the administrative costs borne by firms: Ernst & Whinney estimated these costs per consignment for the importers and the exporters of each of the countries analysed and for different products. This primary quantitative information provided the basis for deduction of the share of these costs in the value of bilateral trade flows between Community countries in the HERMES sectoral nomenclature which, after addition of the costs associated with customs delays, gave the share of the total cost of customs controls in this value. Table 2.2 gives these total customs formalities' cost shares in the bilateral trade flow values, taking all products together (see Catinat and Italianer (1988) for a sectoral breakdown at the HERMES nomenclature level).

Table 2.2 Share of the cost of the administrative formalities borne by firms in the value of bilateral trade flows - all products taken together

(%)

Exporter \ Importer	B	D	F	I	NL	UK	Other Community countries	EUR12
B	-	0,84	1,21	1,42	0,94	0,84	1,01	1,02
D	1,45	-	2,10	2,17	1,82	1,67	1,85	1,87
F	1,64	1,72	-	2,25	1,84	1,72	1,69	1,83
I	1,76	2,25	2,30	-	1,95	1,83	1,80	2,11
NL	1,05	1,22	1,40	1,59	-	1,27	1,35	1,26
UK	1,87	1,20	1,55	1,91	1,33	-	1,76	1,54
Other Community countries	1,49	2,02	2,10	2,14	1,73	1,79	1,82	1,93
EUR12	1,46	1,53	1,84	2,04	1,55	1,58	1,71	1,67

Source: Catinat and Italianer (1988).

The procedure for putting these values in the model was based on the assumption that it is reasonable to believe that the elimination of these costs would be passed on in prices. The bilateral import prices from Community countries for the countries analysed were thus reduced accordingly, as indicated in Table 2.2.

But this fall in prices would be partly achieved by job losses estimated at around 17 500 in exporting firms and at around 40 000 for private agents dealing with customs formalities. Due to lack of information, the job losses were assigned respectively to the competitive branches and to transport in proportion to the corresponding employment provided by each of the sectors in each country. Similarly, the costs borne by the public authorities would imply a decrease in public employment of a little over 0,1% (see Table 2.3).

.../...

Table 2.3 Inputs for the "customs barriers" simulation

	B	D	F	I	NL	UK	EUR12	EUR12 (as % of GDP)
Customs barriers								
Average fall in the prices of intra-Community imports (%)	1,46	1,53	1,84	2,04	1,55	1,58	1,67	-
Job losses (thousands)								
-exporting firms	Distributed in proportion to the corresponding employment in each country						17,5	-
-customs clearing agents							40,0	-
-customs officers (as a % of public employment)	0,41	0,06	0,21	0,06	0,22	0,07	0,11	-
Total shock (% of GDP)	-	-	-	-	-	-	-	0,26

Source: Catinat and Italianer (1988)

2.2 Simulation results

2.2.1 The Community as a whole

The reduction in the price of intra-Community imports would give rise to two types of substitution for each Member State:

- substitution between national production and imports from the Community in favour of the latter;

- substitution between extra-Community imports and intra-Community imports in favour of the latter.

Each Member State would benefit from improved terms of trade brought about by the fall in import prices (0,6% in the medium term in average - see Table A3.2 in Annex 3). The effect on their trade balance in volume terms is more difficult to determine in advance, because of two conflicting phenomena: the increase of imports and, symmetrically, the increase in exports (counterpart of the increase in the imports of the other Member States).

On the other hand, for the Community as a whole, the resultant impact is unambiguous: the first substitution effect is neutral in terms of volume but beneficial in terms of price (improvement in each country's terms of trade); the second is favourable in terms of volume, since it increases the Community's trade balance in volume terms, and neutral in terms of price. In the medium term, the HERMES simulations confirm this analysis: the Community's external balance improves by 0,16 percentage point of GDP (see Table 2.4).

.../...

In addition, the substitution between national production and imports from the Community also has favourable effects on the costs of firms, because it brings down the prices of imported intermediate consumption. These cost reductions passed on in prices would spread to the whole of the economy through intersectoral trade. Even if the upturn in activity is likely to increase the dangers of demand pull inflation, the disinflationary effect seems to prevail, perhaps slightly in the short term (consumer prices and the GDP deflator falling by 0,21% and 0,01% respectively), but significantly in the medium term (1,02% and 0,85% respectively for the Community as a whole). The Community's price-competitiveness would be increased, and as a result the improvement in the external balance would be strengthened.

The consequences for activity of the elimination of frontier controls would come about by means of different mechanisms: external trade would have a direct positive effect on growth, while the relative fall in consumer prices would have a favourable impact by boosting the purchasing power of households. However, the initial job losses (ex-ante loss of more than 80 000 private and public jobs[1]) would have the consequence of reducing personal disposable incomes and of counteracting the positive effects described above: according to the HERMES model simulations, Community GDP could fall slightly in the short term. This could be the price to pay. But this adjustment cost is the condition on which, in the medium term, the abolition of customs controls can contribute to upturn in activity. The HERMES simulations are clear on this point: Community GDP could increase by almost 0,4% in the medium term.

Table 2.4 "Customs barriers" simulation: main macro-economic results for EUR12

	Year1	Year2	Year3	Year4	Year5	Year6
Percentage differences						
Gross domestic product	-0,01	0,10	0,20	0,27	0,33	0,36
Private consumption price	-0,21	-0,41	-0,61	-0,78	-0,92	-1,02
GDP deflator	-0,01	-0,23	-0,42	-0,60	-0,74	-0,85
Real wage rate	0,06	0,10	0,15	0,20	0,25	0,29
Labour productivity/head	0,05	0,13	0,18	0,19	0,20	0,20
Employment	-0,06	-0,03	0,03	0,08	0,13	0,16
Absolute differences						
Employment ('000)	-67	-32	33	102	164	211
Budget surplus % GDP	0,03	0,08	0,12	0,16	0,19	0,21
External balance % GDP	0,17	0,16	0,16	0,16	0,16	0,16

Source: HERMES simulation

[1] It must be stressed that, for technical reasons, these job losses were concentrated at the beginning of the period analysed. In fact, they will probably be spread over a period of time.

.../...

Employment would follow the same momentum: job losses in the short term (around 70 000 for the Community thus slightly less than the initial shock), but net job creation in the medium term as a result of the upturn in activity (over 200 000 for the Community as a whole).

The general government balance should improve in the short and medium term although for different reasons (0,03% of GDP in the short term and 0,21% of GDP in the medium term): in the short term this would result mainly from the budgetary savings made through the abolition of jobs in the customs service; in the medium term, it would stem largely from the upturn in economic activity and the consequent increase in tax revenue.

With an upturn in activity (0,36% of GDP in the medium term), job creation (+210 000 jobs in the medium term), disinflation (consumer price inflation down by 1% in the medium term) and an easing of budgetary and external constraints, (respective improvements of 0,21 and 0,16 of a percentage point of GDP in the medium term), the abolition of customs barriers has the characteristic of being benefical whatever aggregate is considered for the Community as a whole.

2.2.2 Individual country results

As already stated above in section 1, a comparison of individual country results has to be done with caution in order not to attribute differences in simulation results to differences in shocks while in reality they are due to model behavioural differences. Keeping this in mind, the medium term effects for a number of important variables are compared in Table 2.5 among the six countries which have been given shocks (more detailed results are given in Table A2.1 in Annex 2).

Since two of the three employment shocks have been equally distributed among the countries, the differences among country results arise mainly from different changes in the (bilateral) intra-Community cif import prices (apart from behavioural differences). These price decreases bear no one-to-one relationship with the effects on GDP, however, since they touch several vital parts of the economy simultaneously. For instance, there is a negative effect on GDP from the import substitution provoked by the lower import prices. On the other hand, this import increase will favour exports of Community countries more than those of third countries since only intra-Community import prices are decreasing, therefore largely offsetting the initial loss through export increases. These export increases are not only directly proportional with the relative price decreases of each country, but also with its intra-EC trade share, thus introducing another differential element. At the same time, the import price decreases start off a disinflationary wage-price spiral which, depending on patterns of wage formation, may lead to differences in real wage increases. While the lower prices enhance competitiveness and boost exports, the real wage increases affect private spending through increased real disposable income and the substitution of labour for capital, pushing up investment.

Strongly positive effects on private spending are notably visible for Germany and the Netherlands, which would consequently experience the highest GDP increases with 0,57% and 0,45% respectively. These results may partly be attributed to behavioural differences compared to other countries, the wages in these two countries reacting fairly strong to productivity and unemployment changes. The increases in GDP for Belgium, France and the United Kingdom would be close to each other, somewhat above 0,3%. The relatively strong increase of the (nominal) trade balance in Belgium is mostly due to terms of trade increases, the real trade balance being hardly affected. The equally strong rise in the budget balance may be attributed mainly to the decrease in customs officials for this country (cf. Table 2.3), which would cut government employment at least twice as much as in the other countries analysed. The smallest growth (0,24%) would be experienced in Italy, and this fact seems to be due to a negative contribution of the real trade balance. The costs of customs formalities for trade with Italy being high, there is a larger scope for a decrease in intra-EC import prices in Italy than in the other countries analysed. Consequently, relatively more import substitution is likely to take place, thus resulting in a negative real trade balance effect.

Table 2.5 "Customs barriers" simulation: comparison of medium term results among countries

	B	D	F	I	NL	UK	EUR12
Percentage differences							
Gross domestic product	0,34	0,57	0,34	0,24	0,45	0,31	0,37
Private consumption	0,41	0,61	0,27	0,42	0,55	0,28	0,40
Total fixed investment	0,61	0,76	0,45	0,20	0,93	0,29	0,47
Consumption price	-1,25	-1,27	-1,09	-0,68	- 0,94	-1,21	-1,02
GDP deflator	-0,55	-1,10	-0,98	-0,43	- 0,51	-1,15	-0,84
Real wage rate	0,10	0,55	0,10	0,37	0,51	0,18	0,31
Labour productivity/head	0,14	0,23	0,30	0,08	0,29	0,12	0,19
Employment	0,13	0,34	0,03	0,10	0,15	0,20	0,17
Absolute differences							
Employment ('000)	5	89	6	21	8	58	215
Budget surplus as % of GDP	0,67	0,21	0,15	0,22	0,32	0,21	0,21
External balance as % of GDP	0,77	0,03	0,27	0,16	0,11	0,15	0,16
Reminder							
Shocks as % of GDP	-	-	-	-	-	-	0,26

Source: HERMES simulation

.../...

3. OPENING UP OF PUBLIC PROCUREMENT

Public purchasing covers all purchases - intermediate consumption or investment - made by government but also by the "public enterprises" which, by virtue of their status, the public nature of their production or their strategic importance, are in a relatonship of dependence on the public authorities. The opening up of public contract procurement covers only part of these purchases: those which give rise to calls for tender or for negotiation, since the other purchases are made by order or direct payment at a level which is necessarily local. Public (contract) procurement represented around 55% of public purchasing in 1986 (cf. Commission of the EC, 1988, p. 54).

3.1 Simulation characteristics

3.1.1 Quantitative information available

Atkins-Planning, the consultant asked to produce a study of public procurement, distinguishes three types of effect which may be generated by the opening up of such markets:

- a static effect due to increased penetration by foreign products. Through buying from cheaper foreign suppliers, governments and public enterprises would spend less for a given quantity of goods. The static effect pre-supposes that there will be no price change for either imported goods or those produced within the country. The effect is thus purely structural - substitution between domestically produced and imported goods.

- a competition effect, since, faced with increased competition in previously protected markets, national firms should be forced to lower their prices to compete with the prices of imported goods.

- a restructuring effect; under the pressure of competition some supply sectors[1] would be induced to restructure (mergers, exploitation of economies of scale, removal of X-inefficiency, reduction of monopoly rents) and to increase productivity. The reduction in production costs would lead to a parallel reduction in production and import prices.

Formally, these three effects are analysed as follows:

For a given product traded through public contracts, initial expenditure is equivalent to:

(1) $pQ + p_m M$ where Q = volume of products purchased of national origin
M = volume of imported products of foreign origin
p = price of purchases of national origin
p_m = price of imported purchases.

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[1] Essentially equipment goods branches: metal products (boilers, etc.), electrical equipment (turbine generators, telephone switching) or transport equipment (locomotives).

.../...

After the opening up of public procurement, under the assumption that domestic prices in the end are aligned to foreign prices, expenditure becomes:

(2) $(p_m + dp_m)\ (Q + dQ) + (p_m + dp_m)\ (M + dM)$

The difference between the initial and final expenditure values is the sum of three factors:

(3) $(p_m + dp_m)\ (Q + dQ) + (p_m + dp_m)\ (M + dM) - (pQ + p_mM) =$

$p(Q + dQ) + p_m\ (M + dM) - (pQ + p_mM)$	Static effect: the additional purchasing from abroad implies that $dM > 0$ and $dQ < 0$
$+\ p_m\ (Q + dQ) - p(Q + dQ)$	Competition effect: national producers align their price on import price; p becomes equal to p_m
$+\ dp_m\ (Q + dQ) + dp_m\ (M + dM)$	Restructuring effect: the price of national production ($p = p_m$) and import prices fall by $dp_m < 0$

The effects quantified by Atkins-Planning are therefore both static and dynamic (competition and restructuring effects). Several scenarios were envisaged whereby the consultant could scan the range of possibilities and evaluate the sensitivity of the figures to changes in the parameters (level of penetration of public markets, sectoral coverage, competitors' price levels).

For the purpose of the simulation exercises, the following - medium - scenario only was chosen:

* 80% of public purchasing of manufactured products, construction products and business services are considered to be potentially accessible to foreign bidders; the remaining 20% can be provided only by local bidders[1].

* For each product analysed, it is assumed that the level of penetration of public markets converges with the penetration of the equivalent private markets.

In the case of this scenario, the potential savings are shown in Table 3.1.

For the Community as a whole, the savings achievable by government and public enterprises will probably amount to 12,7 billion ECU or 0,50% of GDP, of which 0,22% of GDP would be attributable to the static effect, 0,03% to the competition effect and 0,25% to the restructuring effect.

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[1] This restriction concerns the static effects only.

.../...

The Atkins-Planning study provides no breakdown between public administration and enterprises or between intermediate consumption and investment at the sectoral level chosen for the basic calculations (the three-digit NACE-CLIO level).

For the purposes of the simulations, this breakdown had to be carried out.

The products at the three-digit level and the savings relating to them were generally considered as investment if they corresponded to equipment goods or to construction products; the others were allocated solely to the intermediate consumption of public administrations[1]. Also, the possible savings on investments were broken down between public administrations and enterprises on the basis of their headings: telephone switching gear was allocated to public telecommunications enterprises, turbine generators to energy enterprises, locomotives to transport enterprises, etc. Where the allocation of products was less obvious than in the above examples, they were by preference allocated to public administrations.

This breakdown is probably biased in favour of the public administrations (overvaluation of savings) to the detriment of the public enterprises (undervaluation by the same amount).

Quantitatively, the savings in expenditure achievable by public administrations and enterprises could be those from Table 3.1.

Table 3.1 Savings achievable by public administrations and enterprises as a result of the opening up of public procurement - medium scenario

	Effect :	static	competition	restructuring	total
Belgium	mio 1984 ECU	403	62	491	956
	% GDP	0,42	0,06	0,51	0,99
France	mio 1984 ECU	387	132	1599	2118
	% GDP	0,06	0,02	0,26	0,34
F.R. of Germany	mio 1984 ECU	2599	235	1135	3969
	% GDP	0,33	0,03	0,14	0,50
Italy	mio 1984 ECU	981	228	828	2037
	% GDP	0,19	0,04	0,16	0,39
U.K.	mio 1984 ECU	1180	115	2305	3600
	% GDP	0,22	0,02	0,43	0,67
Total	mio 1984 ECU	5550	772	6358	12680
	% GDP[1]	0,22	0,03	0,25	0,50

[1] As percentage of the 5 industrialized countries.

[1] For the sake of simplicity. But it also seemed that public enterprises were all liable to favour domestic suppliers for their investment purchases, but that they were, by contrast, unlikely to do so for their purchases of intermediate goods.

.../...

3.1.2 Introduction of the shocks into the models

The introduction of these effects into the models is complex[1]. It will merely be summarized here.

The static effects were simulated, in the HERMES model, by altering the level of import penetration of public markets (see Table 3.2) and thus substituting purchases of lower-priced imported products for those provided by domestic producers. The volume of imports was thus increased, as was their price elasticity since it is assumed that the public agents who are initially insensitive to price differences (zero price elasticity) will in future make their choices in the light of these differences (the same price elasticity as private agents for similar products). The other two effects of competition and restructuring were introduced by changing prices, of production in the first case, of production and of imports in parallel with the reduction of unit cost as a result of restructuring, in the second case[2]. Reductions in prices on the supply side have as their counterpart reductions in prices for public purchasing (in this instance for purchases of equipment goods): the prices of equipment goods for government and public enterprises have thus been reduced proportionately (see Table 3.2).

Table 3.2 Shocks introduced into the HERMES model
Opening up of public procurement

	B	D	F	I	UK	EUR12	EUR12 % GDP
Static effects							
Increase in the level of import penetration of public markets (percentage points)	8,2	8,5	5,5	4,1	3,9	5,6	0,22
Competition and restructuring effects							
Fall in prices of equipment goods on public markets (%)							0,28
-public administration	0,03	0,13	0,03	0,07	0,12	-	
-public enterprises							
*energy	1,6	1,5	1,7	1,1	1,1	-	
*transport and telecom	8,5	7,8	7,6	11,4	7,2	-	
Total shock as % of GDP	0,99	0,50	0,34	0,39	0,67	-	0,50

Source: Catinat and Italianer (1988)

[1] The main difficulty lies in the fact that the static effects result from a difference in price levels (domestic prices and import prices), but the prices in the models are indices which conform with national accounts concepts. See Catinat and Italianer (1988) for a full description of the method of implementation.

[2] The consequences for employment of the restructuring of industries have not been taken into account ex ante. Therefore, the simulation results for employment might be biased upwards.

During the calculations, it was assumed that all enterprises in the energy and transport and telecommunications branches were public enterprises. This assumption results in an overvaluation of the effects which becomes greater to the extent that the energy and transport and telecommunication branches contain a larger proportion of private enterprises.

The central simulation was based on the assumption that the opening up of public procurement was of benefit to Community suppliers only.

An alternative scenario was also simulated in which it was assumed that intra-Community public procurement would be opened up to the rest of the world without reciprocity, without the protection of public procurement outside the Community being reduced[1].

3.2. Simulation results

3.2.1 The Community as a whole

The macroeconomic consequences of the opening up of public procurement will spread throughout the economy through three channels: public contract suppliers, public enterprises and public administrations.

In the case of public contract suppliers, the pressure of competition should trigger necessary restructuring and contraction - in some cases sharp - of their production costs. The direct beneficiaries of this would of course be governments and public enterprises. It is probable, however, that this restructuring would also affect products not exclusively intended for public agencies. In that case, beneficial effects could appear directly on private markets.

In the case of public administrations, the opening up of public procurement would entail budgetary savings and would therefore help to cut public deficits.

Lastly, in the case of public enterprises, the opening up of public procurement would entail reductions in the average cost of investment spending, since, according to Atkins-Planning, public enterprises could save chiefly on their purchases of equipment goods, by inviting a wider range of foreign suppliers to tender. For the public enterprises, the result would therefore be a fall in their production costs which, it has been assumed, will be passed on in their selling prices (competition policy in the public energy, transport and telecommunications services). These public services have a substantial power of dissemination to the whole of the economy, via the intermediate consumption of the other productive branches and via households. The falls in production cost, starting in these public services, would therefore spread to all the productive branches. The overall effect could therefore well be a slowdown in the general rate of price inflation.

[1] A third scenario corresponds to the opening up of Community public procurement negotiated on the principle of reciprocity with the signatories of the GATT Code. The consequences of such a scenario could be similar to those of the central scenario (opening up of public procurement limited to the Community area).

.../...

According to the central HERMES simulation where the opening up benefits Community suppliers only (cf. Table 3.3 and Table A3.2 in Annex 2 for individual country results), prices would fall progressively in line with the restructuring of the supplier sectors and its spread to all the productive branches and to final demand: around -0,3% in the short term and -1,5% in the medium term for both the deflators of GDP and of consumption (on average over the Community).

Table 3.3 "Public procurement" simulation: main macro-economic results for EUR12

	Year1	Year2	Year3	Year4	Year5	Year6
Percentage differences						
Gross domestic product	0,20	0,25	0,31	0,37	0,45	0,55
Private consumption price	-0,30	-0,48	-0,67	-0,91	-1,17	-1,46
GDP deflator	-0,35	-0,62	-0,86	-1,11	-1,35	-1,58
Real wage rate	0,18	0,11	0,12	0,15	0,20	0,26
Labour productivity/head	0,15	0,13	0,16	0,18	0,23	0,27
Employment	0,05	0,12	0,15	0,19	0,23	0,28
Absolute differences						
Employment ('000)	62	143	192	238	290	356
Budget surplus % GDP	0,11	0,21	0,23	0,26	0,29	0,34
External balance % GDP	-0,01	0,02	0,03	0,05	0,06	0,09

Source: HERMES simulation

The lower rate of inflation, all other things being equal, is a factor which favours growth: the purchasing power of personal disposable income increases and external price competitiveness improves[1]. In the scenario where the opening up of public procurement is limited to the Community area, ex-hypothesis, there is no loss of market share with regard to public contract procurement, taking the average between countries. Everything therefore helps to support activity: according to the HERMES simulations, Community GDP could increase by 0,55% in the medium term. As a result, over 350 000 jobs could be created in the medium term.

The opening up of public procurement would take pressure off the budget deficits. First, it would do so directly, since it is synonymous with budget savings if the quantity of purchases remains unchanged. Second, it would do so indirectly, because the upturn in economic activity and lower inflation are both factors which favour an improvement in budget balances (the tax and parafiscal base expands in real terms, interest charges on the public debt decline).

According to the HERMES simulations, the improvement in budget balances is a large one: of the order of 0,35% in the medium term for the whole of the Community. It is all the larger because the scenario in question implicitly assumes that the public administrations will wish to reduce their debt and will not use the budgetary savings to support demand directly by Keynesian reflation.

[1] With an unchanged exchange rate, as has been assumed.

.../...

The consequences for the external balance depend on the conditions on which public procurement is opened up: an improvement probably results if opening up is limited to the Community area, since the restructuring of the supplier branches on the internal market leads to increases in competitiveness on the external markets.

If public procurement is opened up unilaterally without reciprocity from the rest of the world, the external balance will probably deteriorate because of an increase in the penetration of the internal market with no equivalent increase in the penetration of external markets. Also, the improvement in the budget balance could be very substantially reduced (divided by 2 according to the HERMES simulations): the substitution of imports from outside the Community for domestic production would deprive government of tax revenue, which in certain cases may even exceed the initial budget savings. The activity-bolstering effect described above could be reduced by 25% to 50%, according to exploratory simulations carried out with the help of the HERMES model[1].

3.2.2 Individual country results

The macroeconomic consequences by country are given in Table 3.4 for the scenario in which opening up is limited to the Community area. This means that, ex ante, what is gained by some corresponds to what is gained by others. However, ex post, restructuring in the supplier branches would enable European industrialists to win back market shares on external markets: the size of the market to be shared would increase over time.

With all the precautions which should be taken when comparing the macroeconomic consequences by country (see section 1 on methodology), one observation seems irrefutable: the consequences for activity (GDP or employment) are in magnitude largely determined by the initial shocks quantified upstream of the models (see Table 3.4).

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[1] This alternative simulation (not shown here) assumed that the relative shares of intra- and extra-Community imports in public markets would be the same as in the equivalent private markets. Despite the increase in competition which would result from a penetration of public markets by extra-Community suppliers, the simulation assumed, due to lack of information, that prices would fall by the same amount as if the opening up of procurement were limited to the Community area. In this respect for this alternative scenario, the favourable aspects of opening up public procurement are liable to be undervalued.

.../...

Table 3.4 "Public procurement" simulation: comparison of medium term results among countries

	B	D	F	I	UK	EUR12
Percentage differences						
Gross domestic product	0,78	0,56	0,50	0,39	0,70	0,55
Private consumption	0,02	0,56	0,30	0,33	0,71	0,46
Total fixed investment	1,25	1,52	0,48	0,31	0,97	0,88
Consumption price	-0,30	-2,15	-0,42	-0,45	-2,92	-1,46
GDP deflator	-0,57	-1,79	-0,49	-0,84	-3,41	-1,58
Real wage rate	-0,31	0,37	0,26	0,04	0,42	0,26
Labour productivity/head	0,17	0,29	0,24	0,15	0,62	0,27
Employment	0,66	0,27	0,26	0,20	0,32	0,28
Absolute differences						
Employment ('000)	23	70	57	44	90	356
Budget surplus as % of GDP	0,76	0,23	0,37	0,19	0,51	0,34
External balance as % of GDP	0,80	0,15	0,26	0,02	-0,26	0,09
Reminder						
Shocks as % of GDP	0,99	0,50	0,34	0,39	0,67	0,50

Source: HERMES simulation

The apportionment of the beneficial effects between Community countries will substantially depend on the nationality of the firms currently most efficient in supplying the public markets. The presence in a country of such firms is likely to limit the level of penetration of its market while enabling its public agencies to benefit from price reductions brought about by the increase in competition. It also favours gains in market share on foreign public markets. Lastly it is a factor in the control of industrial restructuring.

The differentiation of consequences by country is therefore determined more by their industrial characteristics or by the extent to which their public market is currently protected, than by the indirect macroeconomic mechanisms brought into play.

According to the HERMES simulations, the multiplier effect (ratio of the relative increase in GDP to the initial shock) is highest in France and lowest in Belgium. The reasons are difficult to determine and this observation would require more detailed analyses. Beyond the primary effects, the logic of which is described in the Atkins-Planning report, three macroeconomic mechanisms seem to predominate:

- the size of the increases in productivity created; they are partly the result of the degree of restructuring of the national firms which supply the public markets; they range from 0,6% in the medium term in the United Kingdom to some 0,15% in Belgium and Italy. The higher they are, the

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more they permit the redistribution of surpluses in the form of profits, wages or lower prices.

- the size of the fall in prices. They are a factor in competitiveness and favour external growth. The reductions in prices are large for the United Kingdom and the Federal Republic of Germany, but are distinctly smaller for the other countries.

- the size of the increases in real wages. Where they are high, they support domestic growth. This is the case for France, Germany and the United Kingdom.

These three mechanisms are interdependent; they operate to a greater or lesser degree depending on the country.

The improvement of budget balances is also a factor to be taken into account. A substantial easing of this constraint is equivalent to increased potential for growth in the more or less distant future, because it permits the implementation of a less restrictive economic policy. On the basis of this criterion, Belgium and the United Kingdom seem as though they ought to benefit more than the other countries from the opening up of public procurement, although the United Kingdom will see its room for manoeuvre on the external balance becoming narrower.

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4. FINANCIAL SERVICES AND CAPITAL MARKET INTEGRATION

The liberalisation of financial services has implications both for consumers and producers of these services. Producers will be able to sell their services in all Community countries under conditions equivalent to those in their home countries (free market entry). Consumers will benefit from the enhanced competition in this field through a larger range of products and lower prices. The full liberalisation of capital, which is a prerequisite for the liberalisation of financial services, will encourage capital movements toward countries or regions with the highest real interest rates, implying an equalisation of the latter in the long run, as for the marginal efficiency of capital[1]. Simulating the liberalisation of capital and financial services therefore amounts to simulating the effects of competition-induced price decreases for financial services, as well as a movement for real interest rates towards convergence. Section 4.1 describes the simulation characteristics used for the simulation of these effects, while the simulation results themselves are presented and discussed in section 4.2.

4.1 Simulation characteristics

This section summarizes the inputs and assumptions used for the simulations concerning the liberalisation of capital and financial services (for a detailed analysis, see Catinat and Italianer (1988)). The simulations themselves were carried out, under the responsibility of the Commission's services, on the Interlink model of the OECD (for a description see OECD (1988) or Richardson (1987) and the references cited therein). Apart from the simulation shocks, the simulations were performed on the assumption of unchanged policy. In addition, the model was used with the options described in the methodological section, in particular with unchanged real interest rates, i.e. accommodation of the real money stock.

This assumption of unchanged real interest rates implies that *ex ante* shocks in real interest rates (as given in this exercise) are also true *ex post*. The option of unchanged nominal exchange rates with fixed real interest rates is justified if one is ready to accept that real exchange rates follow interest rate parity.

The liberalisation of capital and financial services was simulated by giving shocks to seven EC countries simultaneously, i.e. Belgium, Germany, Spain, France, Italy, the Netherlands and the United Kingdom[2]. The shocks were introduced once and for all in the first period, and simulated over a period of six years[3]. A comparison of the simulation results with and without the shocks enables one to evaluate the macro-economic impact of the liberalisation on a number of countries sufficiently large to represent the total Community (95% of 1985 EUR12 GDP).

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[1] Cf. Commission of the EC (1988), Section 5.1

[2] Although simulation inputs for Luxembourg were available, they were not used for simulation, except for the total average price decrease, which was incorporated in the trade effects for the Belgium-Luxembourg Economic Union.

[3] Since the main interest of the exercise lies in the medium run effects, the gradual, as opposed to instantaneous, introduction of the effects was not considered as being meaningful.

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The shocks given to the Interlink model derive mainly from increased competition for the financial services which squeezes the monopoly rents provoked by the existence of a segmented European market. Gradually, the costs of financial intermediation will converge toward the cost level of the most efficient producers, i.e. those producing at the lowest cost. On the basis of this reasoning, the consultants Price Waterhouse have calculated that, on average, the price of financial services in Europe could decrease by as much as 10%.

This result, which is the middle of a range of likely price falls, was arrived at after a price comparison of sixteen representative financial products, cf. Price Waterhouse (1988). The price decreases for these sixteen products could be translated into shocks for five important macroeconomic (model) variables, i.e. short and long term interest rates for households, the long term interest rate for firms, the price of financial services (other than borrowing costs) for households and the price of intermediary consumption of financial services (excluding borrowing costs) for enterprises[1]. To the decrease in the long term interest rate for firms were added the changes in the real interest rates to be expected from the convergence of real interest rates following the integration of capital markets. The shocks given are summarized in Table 4.1. It should be noted that the interest rate decreases (except for the convergence effect) represent decreases in margins of financial intermediation, and do not affect the underlying (money market) rates. In terms of GDP, the shocks represent 0,7% of GDP on average, based on a range from 0,2% (for the Netherlands) to 1,3% (for Spain).

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[1] Cf. Catinat and Italianer (1988). Note that since real interest rates are kept constant, ex ante changes in (real) interest rates are equal to the ex post changes in real interest rates.

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Table 4.1 Simulation inputs for financial liberalisation

	B	D	E	F	I	L	NL	UK	EUR8
A. Decreases in interest rate margins (percentage points):									
- short-term consumer rate for households	0,7	2,2	0,7	1,8	2,6	0	0,6	1,9	1,9
- mortgage rate for households	0,2	0,3	1,0	0,6	0	0,3	0	0	0,2
- long-term rate for firms (including interest rate convergence)	1,2	0,2	0,2	0,5	0,7	1,3	0,9	0,4	0,5
B. Price decreases (%):									
- other financial services for households	16,4	3,4	18,9	10,0	19,8	13,2	3,8	2,8	7,9
- other intermediary financial services for firms	17,7	8,0	26,0	14,3	18,4	6,3	7,5	3,9	10,4
TOTAL									
- average price decrease (%)	11,4	10,3	20,7	12,2	14,3	8,5	4,4	6,7	10,3
- as % of 1985 GDP	0,6	0,6	1,3	0,5	0,7	1,3	0,2	0,8	0,7

Source: Catinat and Italianer (1988). The averages for the eight countries (column "EUR8") have been calculated using 1985 data on value added in the financial service branch as weights. The bottom line was obtained through multiplication of the 1985 share of value added in financial services in GDP by the average price decrease.

4.2 Simulation results

4.2.1 The Community as a whole

Extrapolating the individual country results to EUR12 one obtains the macro-economic effects of financial liberalisation of Table 4.2[1] (Table A2.3 in annex 2 gives the individual country results). In the medium run, the "multiplier" effect is high, with a shock of 0,7% of GDP generating a 1,5% increase in real GDP. The main contributors to this considerable growth result are the decreases in the long-term interest rates for households and firms, boosting both residential and productive investment, suggesting a total investment increase of 2,4% in the medium term (government investment is kept constant in real terms). In addition, demand would be sustained through 1% more private consumption, stimulated in part

[1] The simulation results have been slightly adjusted in order to abstract from historical trade integration effects present in the import equation elasticities.

.../...

by the lower consumer credit rates, and in the longer run by the increase of 0,9% in real disposable income. The latter effect is due to the disinflationary process set in motion through the price decreases, for financial services other than borrowing, which are diffused throughout the productive system and finally would lead to a 1,4% decrease in domestic prices. These price decreases also enhance competitiveness, resulting in a positive contribution of net exports, leading to an increase in the trade balance to GDP ratio of 0,3 percentage point.

For households, the decrease in long-term interest rates for firms implies that capital becomes cheaper than labour, ceteris paribus. Therefore, labour will be substituted by capital due to relative price effects. This effect on employment is clearly present in the first two years of the simulation. After this period, demand is strong enough to compensate for the initial loss in employment, and would result in 440 thousand new jobs in the medium term. In reality the initial negative employment effect is likely to be mitigated through the fact that the liberalisation will only take place gradually instead of instantaneously as introduced in the model simulations. Therefore less emphasis should be put on the short-term simulation results from this point of view.

Table 4.2 "Financial liberalisation" simulation: main macro-economic results for EUR12

	Year1	Year2	Year3	Year4	Year5	Year6
Percentage differences						
Gross domestic product	0,43	1,06	1,33	1,36	1,39	1,46
Private consumption price	-0,47	-0,78	-1,01	-1,19	-1,32	-1,38
GDP deflator	-0,47	-0,77	-1,00	-1,17	-1,31	-1,37
Real wage rate	0,26	0,26	0,28	0,33	0,38	0,42
Labour productivity/head	0,63	1,11	1,19	1,12	1,10	1,11
Employment	-0,20	-0,05	0,14	0,24	0,29	0,36
Absolute differences						
Employment ('000)	-245	-65	171	294	361	440
Budget surplus % GDP	0,02	0,28	0,60	0,78	0,92	1,06
External balance % GDP	-0,03	-0,02	0,15	0,22	0,25	0,26

Source: Interlink simulation on the responsability of the Commission's services

In the medium term, the government budget balance as a percentage of GDP might improve by more than 1 percentage point. With nominal GDP approximately constant, this is mainly the result of lower nominal wage rates and prices paid by the public authorities, in the medium run supported by a lower volume of recipients of unemployment benefit and lower interest payments on government debt.

For the Community as a whole, the medium term effects of the liberalisation of financial services and capital market seem unequivocally positive. The level of output would increase by 1,5%, prices would decrease by 1,4%, while employment could step up by 440 thousand manyears. At the same time

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there could be an alleviation of the internal and external macro-economic constraints, with the government budget constraint and external balance improving with more than 1 and 0,3 percentage point, respectively.

However, these positive results apply only to the medium term. In the short-run the effects are smaller or even negative, as in the case of employment. The indications above showed that this could be due to the instantaneous shocks in the model, affecting the relative price of labour before the price decreases were able to work themselves through as increased demand expectations, with a subsequent offsetting effect on labour demand.

4.2.2 Individual country results

As before, and indicated in the methodological remarks, individual country results (Table A2.3 in Annex 2) are likely to be substantially influenced not only by uncertainty surrounding the model inputs, but also by the specifications of the country models used for simulation. Nevertheless an attempt has been made to compare the medium term individual country results (cf. Table 4.3).

Table 4.3 "Financial liberalisation" simulation: comparison of medium term results

	B	D	E	F	I	NL	UK	EUR12
Percentage differences								
Gross domestic product	1,22	0,96	0,71	1,77	3,01	0,85	0,84	1,46
Private consumption	0,72	0,86	0,73	0,80	1,81	0,46	0,72	0,95
Total fixed investment	2,21	1,04	0,33	3,95	5,00	0,96	1,02	2,42
Consumption price	-1,28	-0,48	-1,59	-0,86	-4,19	-0,82	-0,74	-1,38
GDP deflator	-1,27	-0,10	-1,65	-0,83	-5,03	-0,66	-0,41	-1,37
Real wage rate	1,17	0,66	0,66	0,26	-0,14	0,65	0,56	0,42
Labour productivity/head	0,69	0,54	0,89	1,36	2,55	0,26	0,53	1,11
Employment	0,52	0,42	-0,18	0,41	0,45	0,59	0,31	0,36
Absolute differences								
Employment ('000)	19	108	-21	87	104	28	78	440
Budget surplus % GDP	0,97	0,63	-0,01	1,23	2,50	0,50	0,65	1,06
Trade balance % GDP	0,37	0,20	0,12	0,15	0,52	0,39	0,21	0,26
Reminder								
Shocks as % of GDP	0,6	0,6	1,3	0,5	0,7	0,2	0,8	0,7

Source: Interlink simulation on the responsability of the Commission's services

At first sight, the correlation between, say, the GDP results and the level of the shock is non-existent: The rank correlation coefficient is even (insignificantly) negative, at -.39. Part of this disparity may indeed be attributed to differences in model behaviour, but another part is certainly related to the differences between the five different shocks as given in Table 4.1. In Italy, the country which would experience, with 3%, the highest increase in GDP level, the total shock (as a % of GDP) equals the Community average, but the price decrease of financial services (other than the cost of borrowing) to households is the highest among the eight countries considered. This decrease in consumer prices leads to a strong increase in real disposable income which fuels private consumption, together with a strong decrease in the costs of consumer credit. A similarly large decrease in the price of intermediate financial services to firms is passed through in substantially lower domestic and export prices, causing substitution of imports by domestic production and enhanced competitiveness on foreign markets, permitting gains in market shares (in the medium run, Italian export prices decrease almost three times the European average). The enhanced competitiveness is also due to the fact that productivity increases in Italy are not reflected in wages, such that the real wage rate hardly changes, and even turns slightly negative. Therefore, despite the absence of incentives to residential investment through mortgage cost decreases (bringing down the level of the total shock), it is possible that a total shock equal to the Community average could lead to the strongest results for growth and employment. Similarly, it is equally possible that the country with the largest total shock in terms of GDP, i.c. Spain, is suggested to experience the lowest growth rate and even negative effects on unemployment. This is mainly due to the fact that price decreases are concentrated in the costs of financial services other than borrowing. Therefore, productive investment is much less stimulated than in the other countries. At the same time, the consumer price decreases are only slowly compensated in nominal wages, such that real wages increase, influencing employment negatively. The latter increases labour productivity, which in its turn continues to push real wages, leading to even more unemployment and so on. Spain is therefore an example of a country which does not seem to be able to compensate the negative effect of real wages on employment through increased demand.

France, with a total shock below the Community average, nevertheless would achieve the second best effect on GDP. This is caused exclusively by the strong growth of both residential and productive investment. For residential investment this follows from the relatively strong decrease in the mortgage rates, whereas productive investment is spurred by the relatively fast adjustment of the capital stock to its new equilibrium value as determined by the decrease in the interest rate and thus the user cost of capital.

Apart from France and Italy, all other countries experience GDP increases in the medium run below the Community average. In this group, Belgium would see the strongest effect on GDP with 1,2%, mainly caused by the decrease in the long term interest rate for firms by 1,2 percentage points. The remaining countries (excluding Spain, which was discussed above) fall more or less in the same range, where it is surprising to see the achievement of the Netherlands, despite a total shock of only 0,2% of GDP. As for Belgium, this result can be explained by the more-than-average decline in the interest rate for firms, with 0,9 percentage points. The result for the United Kingdom is influenced by the fact that the relatively efficient financial sector does not leave much room for increases in domestic demand, while the small share of financial services in external trade does not allow this efficiency to be translated in a sizeable contribution of net external trade increases to GDP.

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5. SUPPLY EFFECTS

The generic term "supply effects" is used to analyse the consequences of the strategic reactions of firms faced with the change in environment which will be created by the large internal market. Although these changes are of many kinds, they can be grouped under two headings:

- market size effects. The abolition of non-tariff barriers immediately places firms on a market which is the size of the Community. Exporting to other Community countries or producing for a national destination should become one and the same thing[1].

- the intensification of competition, also as a result of the elimination of non-tariff barriers which at present segment markets and favour the existence of protected situations.

5.1 The construction of an illustrative scenario

A scenario describing the macroeconomic consequences which could result from "supply effects" was constructed step by step. This scenario is illustrative and represents both optimistic and pessimistic hypotheses. It is called illustrative since it describes phenomena which could happen but which are not completely forseeable; optimistic because it presupposed the success of the strategic reactions of firms to the newly created opportunities; finally, it is said to be pessimistic because it does not include certain dynamic phenomena which are felt to be important but which are particularly difficult to quantify: the effects of competition on innovation (Geroski (1988)) and on investment, experience and learning by doing which are particularly important in the high technology industries.

Three stages can be identified.

1. The first stage is confined to the effects quantified by the external consultants. Its sectoral coverage is limited: food manufacturing and processing industries (Group MAC), the building materials sector (BIPE), the pharmaceuticals industry (EAG), telecommunications services and equipment (DIW), the motor vehicle industry, including components, (Ludvigsen), textiles and clothing (IFO and Prometeia) and the business services sector (Peat Marwick). These sectors taken together cover about 25% on non-agricultural non-financial market production. But they are far more representative - although they do not provide an exhaustive picture - of the total supply effects which can be expected from the large internal market, because of the criteria on which they were selected. Apart from textiles and clothing, they have all in fact been chosen because of the scale of the non-tariff barriers which are now on record[2], and therefore the scale of the consequences which would flow from their elimination.

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[1] Apart from the cultural or linguistic differences.

[2] Textiles and clothing was, on the contrary, chosen as an example of a sector in which a large internal market had already been virtually achieved.

The supply effects quantified by the consultants are either direct or indirect. Taking the direct effects, these are equivalent to a fall in prices of intermediate consumption[1]. It is in this way that the fall in unit costs of the related sectors have been simulated. Taking the indirect effects, they are imposed through gains in productivity caused by the restructuring of the processes of production or by a better exploitation of economies of scale. In this case the productivity of the factors of production was increased: the productivity of capital was increased ex-ante in parallel with the introduction of new vintage investments in the capital stock[2], the productivity of labour was increased ex-post. When the sectoral analyses by the consultants provided quantitative information concerning the changes in internal or external market share which could be caused by restructuring, these have been integrated. A summary of the shocks is provided in Table 5.1.

Table 5.1 Decrease in unit costs of production for the industrial branches

	Weight of the branch in % of total industry(1)	D	F	I	UK
Foodstuff industries	18,9	0,79	0,77	0,77	0,76
Building materials produced by the sector of	D F I UK				
-intermediate goods	3,7 3,0 4,7 2,5	0,01	0,27	0,13	0,03
-equipment goods	1,0 0,8 2,3 0,7	0,10	0,23	0,36	0,04
-consumption goods	1,9 0,8 0,7 0,6	0,10	0,13	0,05	0
Automobile	7,1	0,21	0,32	0,35	0,22
Textiles and clothing	6,7	0,03	0,03	0,03	0,07
Total		1,24	1,75	1,69	1,12
Equivalent in bn ECU 1985		29,0			
%point of GDP		0,97			

Source: Catinat and Italianer (1988)

(1) Due to lack of country-by-country information, the share of each branch in total industrial production was assumed to be the same among countries, except for building materials.

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1 Reduced cost of ingredients for food-processing industries, cuts in the prices of building materials for the construction sector, reduced prices of intermediate consumption of market services for producer branches generally, etc.

2 It is in this way that the dynamic related to the restructuring or to the exploitation of the economies of scale, has been incorporated in the models. This supposes implicitly that the latter requires an investment effort (and that they therefore cannot be brought about only by disinvestment or the closures of plants) and that these effects should occur at the same rate as investment. All this is, of course, schematic and formal when compared to economic reality. Less unrealistic, however, than a direct increase in the productivity of existing capital because in this latter case no costs (on investment in particular) are taken into account. For more detail, see Catinat and Italianer (1988).

.../...

2. The second stage concentrated solely on economies of scale effects. For the industrial sectors[1] not covered by the first stage, a greater exploitation of the existing potentialities has been assumed. The hypothesis has been that the average size of the establishments concerned will converge, for each detailed sector (analysed at the three-digit NACE level), towards the minimum efficient technical scale[2]. The estimates thus obtained represent, from the range of possibilities, the upper end of that range. However, it was not possible to cover all the detailed sectors of industry because of a lack of statistical and quantitative information. On average, for industry, the hypotheses for economies of scale therefore do not lead to an overvaluation of potentialities.

   Technically, the procedure for implementing these effects into the model is identical to that described previously for the first stage (see Table 5.2). It is assumed that the strategies for exploiting economies of scale are successful: additional production capacities give rise to an increase in external market share: that is to say, for the Community taken as a whole, the Community market share with the rest of the world, increases.

Table 5.2 Scenario of a greater exploitation of economies of scale
Decrease in unit costs of production

Decrease in unit costs of production in %	For all countries
Energy products	-0,42
Industrial products	-1,52
- branch of intermediate goods	-2,23
- branch of equipment goods	-2,36
- branch of consumption goods	-0,48

Source: Catinat and Italianer (1988)

3. Lastly, the third stage seeks to describe the pure effects of the increased competition which would be caused by the large internal market. More precisely, it is concerned with the consequences of increased competition on monopoly rents and X-inefficiency. The decline in monopoly rents should imply a fall in sales prices by a decline, pure

[1] For the other branches, the service branch in particular, the quantitative information was too fragmentary to permit quantification of economies of scale effects.

[2] A survey carried out by Pratten (1988) has provided, according to the engineering estimates, an evaluation of the optimum production sizes for the major part of the detailed industrial sectors where technical economies of scale are substantial.

.../...

and simple, in firms' profit margins. X-inefficiency should also decline, but by elimination of inefficient areas of activity and so of a reduction in unit costs. The quantitative estimations upstream, as it were, from the models have been made in a deductive way, by using the differences in prices now observed between Member States as an indicator of future competitive pressures; by using the results of the Smith-Venables model (1988); and finally by using the specialist knowledge of experts[1]. These basic estimates at the company level or at the detailed branch level could have been extrapolated to the macroeconomic level, but this would have given rise to unrealistic figures. Consequently, these extrapolations have been significantly reduced. Technically, the procedure for implementing these results into the models was to lower the producer prices of the market branches (simulation of the reduction of X-inefficiency), as given in Table 5.3. Experts have estimated that all these falls in the costs of production may be considered to come from an increase in the productivity of labour (by reorganizing managerial teams).

Table 5.3 Consequence of the strengthening of competition

Branches of HERMES model	Int. goods	Eqp. goods	Cons. goods	Industrial average	Transp +telec (3)	Market serv. (3)
Fall in production prices in % (1)	1,8	1,5	0,7	1,23	1,0	1,0
Decrease in unit costs of production in % (2)	0,72	0,60	0,28	0,50	1,0	1,0

Source: Catinat and Italianer (1988)
(1) By reduction of monopoly rents and X-inefficiencies.
(2) By reduction of X-inefficiencies.
(3) For the service branches, it is assumed that, due to lack of information, the falls in the production prices resulted directly and only from the reduction of X-inefficiencies.

The above tables set out in summary form the principal hypotheses used for the simulation exercises. The procedure for implementing them into the models is complex; it is presented exhaustively in Catinat and Italianer (1988). Only the basic ideas have been set out here.

The time path of supply effects is also complex. Conventionally, due to lack of more precise information, it has been assumed that they would develop gradually over 5 years. This clearly implies a substantial acceleration in their dynamic, in particular for the exploitation of economies of scale or the restructuring of the processes of production.

[1] By examination of audits in firms for the evaluation of X-inefficiency.

5.2 Economic consequences

5.2.1 The Community as a whole

Whatever the supply effects, they all result in the reduction of firms' production costs. The origins of these effects are probably extremely diverse, as is the time-scale on which they appear: the possibility of using less costly ingredients (the case of the food-processing industries), the possibility of low-cost imports (the case of building materials), less need to differentiate products (standardization or mutual recognition), greater potential for exploiting economies of scale, reduction of X-inefficiency under competitive pressure.

All these phenomena will probably combine to reduce production costs. It is very probable that lower costs will be passed on in producer prices in significant proportions since the large internal market should increase competition as a result of the abolition of non-tariff barriers and free access to markets. The fall in prices could even be greater than the fall in costs in cases where strong initial monopolistic powers are dismantled under the pressure of competition. According to the simulations carried out (see Table 5.4), the fall in prices would be very significant in the medium term: averaging -2,3% for consumer prices, and -2,6% for the GDP deflator of the Community of Twelve.

Table 5.4 "Supply effects" simulation: main macro-economic results for EUR12

	Year1	Year2	Year3	Year4	Year5	Year6
Percentage differences						
Gross domestic product	0,51	0,90	1,31	1,64	1,93	2,14
Private consumption price	-0,60	-1,01	-1,41	-1,78	-2,08	-2,29
GDP deflator	-0,85	-1,32	-1,76	-2,14	-2,44	-2,65
Real wage rate	0,26	0,32	0,56	0,80	1,04	1,25
Labour productivity/head	0,75	0,97	1,18	1,31	1,42	1,47
Employment	-0,23	-0,07	0,13	0,33	0,51	0,68
Absolute differences						
Employment ('000)	-284	-86	156	409	647	859
Budget surplus % GDP	-0,03	0,15	0,23	0,37	0,49	0,62
External balance % GDP	0,18	0,23	0,29	0,34	0,40	0,45

Source: HERMES simulation

Part of the supply effects stem from an increase in the productivity of the factors of production, labour in particular. These gains in productivity would make it possible not only to reduce inflationary strains, but also to satisfy real wage claims without aggravating unit costs. The Community's internal demand would therefore be stimulated by an improvement in real incomes, while foreign demand would be stimulated by improvements in competitiveness. This would produce an activity bolstering effect: Community GDP could increase by around 2,1% in the medium term. Comparing this result with the inital shock introduced into the HERMES model, i.e. 3,2% of Community GDP[1], the macroeconomic mechanisms have a low multiplier effect. This stems from ex-ante losses of employment caused by the increase in the productivity of labour. Fewer jobs mean less income and therefore an attenuation of the favourable effects of the improvement of supply: when GDP increases by 2,1% in the medium term, employment rises only some 860 000, or 1,2% of Community employment. In the short term, the weakness of the employment content of supply effects is even still more striking: a 0,5% increase in Community GDP would be matched by a loss of employment of almost 300 000 jobs. These losses are unavoidable, and an attempt to avoid them would lead to a rejection of the improvement in supply conditions.

Lastly, two beneficial effects should be stressed: the external and budget balances would simultaneously improve by 0,4 and 0,6 of a percentage point of GDP respectively in the medium term for the Community as a whole. The former improvement would result from the increases in competitiveness induced by the greater dynamism of the productive system (fall in prodution costs, increased flexibility, stimulus to product innovation and differentiation[2]). The latter is due to a favourable mechanical effect on budget resources of the upturn of activity.

5.2.2 Individual country results

In the case of supply effects, the quantitative information available related only to the four large Community countries: the Federal Republic of Germany, France, Italy and the United Kingdom. Only the data provided by the external consultants made it possible to introduce different shocks per country. For the economy of scale effects and for the pure competition effects, the same shocks have been introduced for each of the different countries analysed. Overall, the shocks introduced are therefore very close for each country.

The macroeconomic consequences simulated by the HERMES model are set out in detail in Table A2.4 in annex 2. Table 5.5 compares the medium term results for some important variables among the four countries.

They are very broadly similar qualitatively and quantitatively: an increase in GDP in the medium term (from 1,8% for Italy to 2,4% for France), a fall in prices (from -1,8% for Italy to -2,6% for the United Kingdom in the case of consumer prices), creation of employment, improvement of budget and external balances (from 0,4% of GDP for the United Kingdom to 0,9% for France, from 0,3% for Germany to 0,7% for France respectively).

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[1] Cf. Catinat and Italianer (1988).

[2] Technically, only the first factor - the fall in production costs - is endogenous to the simulation.

Table 5.5 "Supply effects" simulation: comparison of medium term results among countries

	D	F	I	UK	EUR12
Percentage differences					
Gross domestic product	2,10	2,45	1,82	2,15	2,14
Private consumption	1,55	1,04	1,23	1,20	1,27
Total fixed investment	1,88	1,90	1,41	1,13	1,63
Consumption price	-2,26	-2,53	-1,75	-2,56	-2,29
GDP deflator	-2,21	-3,33	-2,04	-3,09	-2,65
Real wage rate	1,56	0,88	0,94	1,55	1,25
Labour productivity/head	1,45	1,64	1,10	1,62	1,47
Employment	0,65	0,87	0,64	0,56	0,68
Absolute differences					
Employment ('000)	170	192	139	159	859
Budget surplus as % of GDP	0,45	0,89	0,73	0,43	0,62
External balance as % of GDP	0,32	0,66	0,34	0,48	0,45
Reminder					
Shocks as % of GDP	-	-	-	-	3,24

Source: HERMES simulation

It is difficult to attribute these differences to genuine differences in macroeconomic mechanisms or to fortuitous differences in the specifications of national models. In the case of Italy, the impacts generally seem to be weaker than for the other countries. Technically this is due to relatively small ex-post increases in the productivity of labour (despite a relatively strong ex-ante shock). To go further than this statement would require an entirely separate comparative analysis.

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6. COMPLETING THE INTERNAL MARKET: OVERALL ASSESSMENT AND INTERCOUNTRY COMPARISON

The four simulation exercises which were presented in the previous sections all concerned separate aspects of the internal market programme. Care has been taken not to include in one simulation effects that were also included in another one. As a consequence, there is no overlapping, and from the sum of the simulation results one can form a global picture of the macro-economic implications of the completion of the internal market. On the other hand, some consequences of the White Paper have not been covered, such as the effects of stronger competition on innovation, or the learning effects (dynamic economies of scale)[1]. While the total result will, due to such omissions, probably underestimate the gains to be achieved, it is equally true that the included effects were simulated on the premiss of success for the corresponding business strategies, thus balancing the results.

This section presents the aggregation of the simulation results for the four areas which were simulated (customs barriers, public markets, financial services and capital market liberalization and supply effects), and furthermore attempts to compare the aggregate results among the four largest economies of the Community: Germany, France, Italy and the United Kingdom[2]. Finally, some comments are made on the likely structure of increases in employment.

6.1 The impact of the internal market on the Community as a whole

Table 6.1 gives the total effects on the Community if the extrapolated results for EUR 12 of the four areas are aggregated. The medium term macro-economic effects would unequivocally be positive: the level of GDP could increase by 4,5%, domestic prices decrease by more than 6% while more than 1,8 million new jobs could be created. At the same time the government budget constraint (as a % of GDP) would improve by 2,2 percentage points, while the external balance (also as a % of GDP) gains 1 percentage point.

Of the increase in GDP, more than 40% is due to the increase in private consumption of 3,1% (see Annex 3 for the detailed macroeconomic results). The completion of the internal market enhances labour productivity through economies of scale, restructuring and the elimination of X-inefficiency. About two-thirds of the increase in labour productivity is passed on to households in the form of real wage increases, thus reducing the labour share in national income. The ensuing rise in real disposable income then becomes the main driving force in pushing up private consumption. Other factors which exert a positive influence on consumption are the lower interest rates and the real wealth effects induced by the general price decreases.

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[1] Furthermore, the approximation of indirect taxation has not been analysed in this paper, but to the extent that the proposal of the Commission aimed at provoking the budgetary impact to be as weak as possible on average for the Community, it is likely that the macroeconomic consequences of this approximation should also be small.

[2] These were the only four countries for which all four areas were simulated.

After private consumption, private investment by households and firms accounts for approximately 25% of the increase in GDP. Private investment is stimulated through increased demand expectations and a decrease in the cost of capital relative to other production factors. The decrease in the relative cost of capital is partially brought about by decreases in the cost of financial intermediation, implying also lower mortgage rates for households, for instance.

Of the remaining part of the increase in real GDP, again approximately 25% is due to an improvement in the real foreign balance. The price decreases which were caused by the abolition of customs formalities, enhanced competition and productivity increases translate into improvements in price competitiveness with respect to third countries, thus permitting gains in market shares.

It is important to note that almost three quarters of the predicted increase in Community production is due to increases in domestic demand. Therefore it is clear that the completion of the internal market is a vital instrument in promoting European growth which is internally stimulated and less dependent on developments in the rest of the world economy. At the same time, however, higher European growth contributes to an increase in international trade.

The 1,8 million new jobs that are to be expected in the medium run correspond to an increase in employment of 1,5%. With GDP increasing by 4,5% it is thus clear that factors come into play which exert a detrimental effect on the labour demand arising from increases in GDP alone (the elasticity of labour demand with respect to production is often assumed to be equal to one). The main factor which slows down labour demand is the increase in labour productivity, which is a typically supply-oriented consequence of the completion of the internal market. In order to render this supply policy more employment-creating, it should be accompanied by appropriate demand policies. Demand may be increased by transferring the productivity increases to households in the form of higher real wages, or by using the alleviation of macro-economic constraints, such as the government's budget deficit, to stimulate growth. The former approach requires a delicate balance between the stimulus to demand from increased purchasing power and the offsetting effects on employment if real wages become too high (classical unemployment). As may be seen from Table 6.1, it results from the model simulations that about 50-70% of the productivity increases are reflected in higher real wages[1], thus implying at the same time a stimulus to demand and some real wage moderation. While the distribution of productivity increases among wages, profits or lower prices is not really an issue policy makers decide upon, the contrary is the case for what concerns the use of extra room for manoeuvre created if the government budget balance ameliorates. With an average improvement of 2,2 percentage points, there is indeed a large scope for the European governments to stimulate demand, potential output and employment. Since the choice among the different possible uses of the extra room for economic policy is a political one, it will not be pursued any further here[2].

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[1] Next to productivity, lower unemployment also puts some upward pressure on real wages.

[2] Cf. Commission of the EC (1988), Ch.10, where some calculations in this field are presented.

.../...

Table 6.1 Completion of the internal market: aggregation of main macro-economic results

	Year1	Year2	Year3	Year4	Year5	Year6
EUR12						
Percentage differences						
Gross domestic product	1,13	2,31	3,16	3,64	4,10	4,52
Private consumption price	-1,58	-2,68	-3,71	-4,66	-5,49	-6,16
GDP deflator	-1,68	-2,93	-4,04	-5,02	-5,84	-6,45
Real wage rate	0,77	0,80	1,11	1,48	1,86	2,22
Labour productivity/head	1,57	2,35	2,72	2,81	2,95	3,04
Employment	-0,44	-0,03	0,45	0,83	1,16	1,47
Absolute differences						
Employment ('000)	-533	-40	552	1043	1462	1866
Budget surplus % GDP	0,13	0,72	1,19	1,57	1,89	2,22
External balance % GDP	0,30	0,39	0,63	0,76	0,86	0,95
F.R. OF GERMANY						
Percentage differences						
Gross domestic product	1,22	1,97	2,57	2,89	3,52	4,20
Private consumption price	-0,74	-1,46	-2,30	-3,52	-4,90	-6,16
GDP deflator	-0,45	-1,09	-1,74	-2,82	-4,10	-5,20
Real wage rate	0,44	0,91	1,44	1,87	2,48	3,14
Labour productivity/head	1,53	1,84	2,07	2,08	2,32	2,51
Employment	-0,31	0,14	0,50	0,80	1,19	1,68
Absolute differences						
Employment ('000)	-78	34	129	208	311	438
Budget surplus % GDP	0,13	0,55	0,77	0,95	1,18	1,52
External balance % GDP	0,49	0,53	0,69	0,73	0,68	0,70
FRANCE						
Percentage differences						
Gross domestic product	1,09	1,97	2,88	3,65	4,41	5,05
Private consumption price	-1,00	-1,64	-2,43	-3,27	-4,12	-4,89
GDP deflator	-1,53	-2,19	-3,07	-3,97	-4,86	-5,63
Real wage rate	0,43	0,34	0,48	0,74	1,09	1,51
Labour productivity/head	1,37	2,00	2,56	2,95	3,30	3,54
Employment	-0,28	-0,02	0,34	0,73	1,15	1,57
Absolute differences						
Employment ('000)	-60	-5	73	159	250	342
Budget surplus % GDP	0,04	0,40	0,90	1,45	2,05	2,64
External balance % GDP	0,42	0,57	0,82	0,98	1,15	1,35
ITALY						
Percentage differences						
Gross domestic product	1,35	3,25	4,54	5,15	5,41	5,46
Private consumption price	-2,30	-4,04	-5,55	-6,55	-7,02	-7,07
GDP deflator	-2,58	-4,59	-6,38	-7,58	-8,19	-8,34
Real wage rate	0,91	0,96	1,07	1,19	1,19	1,21
Labour productivity/head	1,94	3,41	4,20	4,34	4,18	3,89
Employment	-0,62	-0,22	0,26	0,70	1,08	1,40
Absolute differences						
Employment ('000)	-136	-50	53	150	236	308
Budget surplus % GDP	0,28	1,36	2,17	2,82	3,30	3,65
External balance % GDP	0,34	0,37	0,79	0,90	1,00	1,03
UNITED KINGDOM						
Percentage differences						
Gross domestic product	0,81	2,44	3,29	3,59	3,79	4,00
Private consumption price	-2,55	-4,33	-5,57	-6,39	-6,96	-7,43
GDP deflator	-2,52	-4,72	-6,26	-7,14	-7,66	-8,06
Real wage rate	0,94	0,65	1,12	1,83	2,40	2,71
Labour productivity/head	1,79	2,95	3,10	2,93	2,89	2,91
Employment	-0,64	-0,08	0,65	1,07	1,26	1,39
Absolute differences						
Employment ('000)	-157	-16	167	285	342	385
Budget surplus % GDP	-0,06	0,71	1,32	1,61	1,69	1,80
External balance % GDP	-0,33	-0,32	-0,02	0,28	0,49	0,61

.../...

6.2 The internal market in the four major European economies

For Germany, France, Italy and the United Kingdom, simulation results are available for all four areas which were simulated; for the other member countries, one or more of the areas could not be simulated, due to lack of information. Given that the simulation inputs do not overlap, it is possible to calculate the macro-economic effects of completion of the internal market for these four countries, and to compare them to each other. The corresponding results are presented in Table 6.1. In Table 6.2 an attempt is made to relate the input shocks (as a % of GDP) to the medium term effects on GDP. It should be stressed that expressing the shocks as a % of GDP does not imply that the effect on GDP may be interpreted as a Keynesian (expenditure) multiplier. The shocks merely represent cost decreases and only bear partial resemblance to standard multiplier shocks. This was illustrated in the section on the simulation of financial services. In this instance, therefore, "multiplier" means specifically the ratio of the effect and the shock, both as a percentage of GDP.

Table 6.2 Comparison of model inputs with medium run effects on GDP, four major countries and EUR12

Item	Germany S	Germany E	France S	France E	Italy S	Italy E	UK S	UK E	EUR12 S	EUR12 E
1. Customs barriers	0,21	0,57	0,23	0,34	0,21	0,24	0,18	0,31	0,26	0,36
2. Public markets	0,50	0,56	0,34	0,50	0,39	0,39	0,67	0,70	0,50	0,55
3. Financial services	0,55	0,96	0,53	1,77	0,69	3,01	0,79	0,84	0,66	1,46
4. Supply effects	3,09	2,10	3,48	2,45	3,43	1,82	3,00	2,15	3,24	2,14
Total	4,35	4,20	4,58	5,05	4,72	5,46	4,64	4,00	4,66	4,52

S = Shock: simulation inputs as a % of 1985 GDP (cost decrease)
E = Effect: % increase in real GDP after 6 years

Notwithstanding, it may be seen that on average the increases in GDP are reasonably close to the input shocks. For the Community as a whole, for instance, a shock of 4,7% would generate a GDP increase of 4,5%, suggesting a "multiplier" value close to one. Still for the Community as a whole, the shock-effect relationships for the four areas individually also seem to make sense. The "multipliers" for customs barriers and public markets are in the middle of the range, with values of 1,4 and 1,1. The value 2,2 for financial services is high but not exceptional given that financial services permeate throughout the whole economic system, as was described in the corresponding section above. In this simulation, price decreases were seen to influence private consumption, fixed capital formation, the costs of living and costs of production at the same time, thus touching all vital parts of the macro-ecnomic linkages simultaneously. The low value 0,7 of the shock-effect multiplier for the supply simulations is not a surprise either, since the supply effects bear mainly on the optimal allocation of production factors, and depend heavily on the extend to which production

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efficiency is passed on to households. Furthermore, the initial decrease in employment following labour productivity increases spills over to domestic demand, thus reducing the medium term effect on GDP as well. Thus, while the relationship between shocks and effects does seem to make sense at an aggregate level (the last row and column of Table 6.2, say), it seems to be less evident at the level of individual areas and countries.

The implication of the existence of this loose band between shocks and results is that differences in simulation results between countries can only partially be explained on the basis of differences in input shocks expressed as a % of GDP. A more precise explanation should take account of the heterogeneity of the shocks and differences in size.

The simulated medium term effects on GDP range from a 4,0% increase for the United Kingdom to a 5,5% increase for Italy. Given the large margins of uncertainty surrounding both model inputs and simulation results, there is no evidence to say that these results are significantly different from each other. Therefore, in explaining the differences between the point estimates, this aspect should always be kept in mind.

The fact that Italy comes out strongest with a 5,5% increase in GDP is entirely due to the positive results in the field of financial services. For the three other areas, the results for Italy are the weakest each time. In the section on financial services it was already pointed out that the positive results in that field were mainly due to the large scope for price decreases, improving real disposable income and therefore consumer spending, demand expectations and investment. The aggregate result confirms this picture, with the GDP deflator decreasing more than 8% over six years. As noted above, high growth does not necessarily imply high labour demand. Despite the highest increase in GDP, Italy would have -with the UK- the smallest increase in employment with 1,4% in the medium run, mainly due to the large increase in labour productivity for this country.

In terms of increases in GDP, France would obtain the second best result after Italy, with a 5,1% increase, still higher than the Community average of 4,5%. Comparatively speaking this result is mostly due to supply effects and, to a lesser extent, the liberalisation of financial services. Despite lower growth than in Italy, the employment response in France is somewhat stronger due to a smaller productivity increase. Compared to Italy, growth is more export-oriented due to a moderate increase in real wages which is less beneficial for private consumption but tends to increase competitiveness.

There is a dichotomy between, on the one hand, France and Italy with GDP increases around 5%, and, on the other hand, Germany and the United Kingdom with increases around 4%. For what concerns financial services and supply effects, the effects on GDP for these two countries are almost identical, but there are differences between the results for public markets and notably customs barriers. Despite GDP increases in the same range, the composition of growth is much more oriented towards private spending and notably investment in Germany than in the United Kingdom; in particular, the contribution of net external trade would be double that of Germany. With the domestically oriented industries being more labour intensive, this implies stronger employment growth in Germany than in the United Kingdom: 1,7% against 1,4%.

6.3 The structure of the employment effects

The unemployment problem is one of the most important issues of economic policy in Europe at present. This subsection tries to say something more on the distribution of the employment gains described above.

The distribution of the effects on employment to be expected from the completion of the internal market has three dimensions: a temporal dimension, a geographical dimension and a sectoral dimension. Only if all aspects (including timing) of the completion of the internal market would have been simulated with sectoral models for all European countries, would it have been possible to say something definite on each of these three dimensions. Any attempt at conclusion based on results that do not satisfy this criterion is therefore surrounded with uncertainty, the extent of which depends on the area concerned.

Table 6.1 suggests that the timing of the effects on aggregate employment is such that there is a loss of more than half a million jobs in the first year, almost no change in the second year and a gradual increase to more than 1,8 million jobs in the medium run. This particular timing is, however, strongly influenced by the hypotheses underlying the simulations, which assume that the corresponding effect takes place completely from the first year of the simulation onwards or which is spread out over a five-year period[1]. Consequently, all the negative effects on employment due to the restructuring of industries or the reduction of custom related employment are concentrated in the first years of the simulation period. In reality, the process of completion of the internal market is a gradual one, in which 1) the different measures are not taking effect all at the same time and 2) the effects of each measure are not always immediate but spread out over a period of time. Although job losses cannot be denied and are even to be considered inevitable, it is highly unlikely, therefore, that they will be produced at the rate suggested by the simulations. Rather will the dynamic profile of the employment effects be smoother, with perhaps lower employment increases for some longer period in the beginning, but certainly not the massive loss of half a million jobs cited above to be concentrated in one single year.

As regards the geographical distribution of employment effects among the member countries, evidence based on all four areas is only available for Germany, France, Italy and the United Kingdom. As discussed in subsection 6.1 above, national differences in employment effects can be explained by national differences in the links between productivity increases, price decreases, real wage increases, expenditure increases and their subsequent effects on employment. Nevertheless, the differences between the effects on employment growth for the four largest European economies seem to remain slight, the effects ranging from 1,7% for Germany and 1,6% for France to 1,4% for Italy and the United Kingdom. However, the model simulations for these four countries are unable to answer two main questions concerning the employment issue: (a) the distribution of jobs between the regions within each of the Member States and (b) the distribution between the less and the most developed Member States.

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[1] In the case of the supply side effects in particular, which assumes an acceleration of the restructuring of industries over time.

As regards the sectoral distribution of the employment effects, generally speaking, this depends on the importance of employment in each branch. As shown in Table 6.3, employment in market services, for instance, is approximately 60% higher than in the manufacturing branch, on average in the Community. Consequently, a one percent increase in employment in each of the two branches generates 60% more jobs in the market services branch than in the manufacturing branch.

The above considerations play a crucial role concerning the sectoral distribution of the more than 1,8 million new jobs which the simulations suggest will result from the completion of the internal market. The single European market will, in a first instance, especially foster the exposed branches of the national economies (traded goods branches) as well as those sheltered branches which become, through the internal market process, newly exposed to internatonal competition (e.g. financial services). Even though they are faced with inevitable restructuring, they are likely, through their increased productivity and enhanced competitiveness, to be the strongest growing branches in the end. It is in these branches that one may thus expect the strongest percentage increases in output and employment in the medium run. The effects of increased output and income are, however, diffused throughout the economy, also affecting other, sheltered, branches, notably parts of the market services branch. Although the percentage increase in output and employment might be smaller in the sheltered branches than in the exposed ones, their larger share in employment would still cause a considerable part of the 1,8 million new jobs to be concentrated there.

This picture is confirmed by the partial evidence from the simulations. Since not all areas of the internal market could be simulated with sectoral HERMES models for all countries[1], only an incomplete table with sectoral employment results can be given (Table 6.4). Excluding the results for financial services, for which no sectoral models were used at all, the partial evidence on which this table is based suggests that the increase in employment in absolute numbers is approximately equal in the manufacturing branch and the market services branch. This is the combined result of 1) a percentage increase in employment which is, with 2,1% versus 1,2%, stronger in the manufacturing branch than in the market services branch, but 2) a larger share in total employment for the latter branch than for the former.

[1] Table 1.1 identifies for which areas and countries sectoral HERMES models were simulated.

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Table 6.3
Share of branches in total occupied population, 1985

%

Branch	B	DK	D	GR	E	F	IRL	I	L[1]	NL	P[2]	UK	EUR8[3]	US	JA
Agriculture	2,9	6,9	5,4	27,5	17,3	7,5	15,8	11,0	4,8	5,9	26,6	2,4	7,3	2,9	11,1
Energy	1,4	0,7	1,8		1,5	1,5		0,9	0,9	1,4	0,9	2,4	1,6	1,3	0,7
Manufacturing	21,3	20,3	30,7		22,2	22,0		23,7	25,7	19,1	23,5	22,7	24,3	17,1	24,0
-Intermediate	4,4	2,2	4,5	26,0	3,7	3,3	28,4	3,7	13,7	3,3	3,5	3,2	3,7	2,1	2,7
-Equipment	7,3	8,0	15,7		7,2	9,4		6,9	4,8	7,3	4,6	10,5	10,2	7,9	11,7
-Consumption	9,5	10,1	10,5		11,3	9,3		13,1	7,2	8,5	15,4	9,0	10,4	7,2	9,5
Building and construction	5,7	6,5	7,2		7,2	7,1		7,6	9,9	7,2	10,1	6,1	7,0	5,3	9,3
Market services	46,3	34,3	35,2		39,2	41,7		38,5	45,9	49,3	24,1	44,6[5]	40,1[5]	49,7	46,2
-Transport and communication	7,1	7,1[4]	5,4[5]	46,5	6,9	6,4	55,8	6,0	6,7[6]	6,9	4,5	6,0[5]	6,1[4]	4,4	5,4
-Other	39,2	26,9[4]	29,6[5]		32,4	35,3		32,5	36,0[6]	42,4	19,6	38,6[5]	33,1[4]	45,4	40,8
Non-market services	22,4	32,1	19,6		12,7	20,2		18,3	12,8	17,1	14,8	20,9[5]	19,1[5]	23,6	8,7
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Total ('000)	3.662	2.428	25.482	3.774	10.500	21.397	1.074	21.151	158	4.561	3.905	24.140	113.400	115.341	61.300

1 1982
2 1981
3 EUR8 = B + DK + D + E + F + I + NL + UK
4 1983
5 1984
6 1978

Source: Sectoral databank (BDS) of the Commission of the EC, DG II: Occupied population. For Greece and Ireland: Eurostat, National Accounts ESA, Aggregates and detailed tables by branch, 1987

Note: When figures for years other than 1985 are given, individual entries may no longer add up to total or subtotals.

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Table 6.4 Extrapolation of sectoral medium term simulation results for employment, EUR12

Branch	Customs barriers '000	%	Public procurem. '000	%	Supply effects '000	%	Subtotal '000	%	Financial Liberalis. '000	%	Total '000	%
Agriculture	14	0,24	17	0,27	78	1,21	109	1,71	:	:	:	:
Energy	8	0,32	6	0,23	4	0,19	18	0,73	:	:	:	:
Manufacturing	74	0,26	104	0,37	417	1,49	596	2,13	:	:	:	:
-Intermediate	8	0,16	16	0,39	62	1,64	86	2,19	:	:	:	:
-Equipment	25	0,19	54	0,44	149	1,21	228	1,84	:	:	:	:
-Consumption	41	0,36	34	0,30	206	1,79	281	2,45	:	:	:	:
Building and construction	21	0,18	30	0,26	71	0,64	122	1,09	:	:	:	:
Market services	137	0,25	199	0,37	288	0,54	625	1,16	:	:	:	:
-Transport and communication	-20	-0,25	53	0,63	74	0,84	106	1,21	:	:	:	:
-Other	157	0,34	146	0,32	214	0,47	518	1,13	:	:	:	:
Non-market services	-43	-0,18	0	0	0	0	-43	-0,18	0	0	-43	-0,18
Total	211	0,16	356	0,28	859	0,68	1426	1,12	440	0,36	1866	1,47

'000 = thousands (absolute difference with respect to baseline simulation)
% = percentage difference with respect to baseline simulation

Source: Extrapolation based on simulation results for the HERMES models only, i.e. 1) results for Belgium, France, Italy and the United Kingdom for "customs barriers" and "public procurement", and 2) results for France, Italy and the United Kingdom for "supply effects".
The basis for extrapolation to EUR12 therefore differs from the one used for the macroeconomic results (except for the total).

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ANNEX 1 MAIN SHOCKS INTRODUCED IN THE HERMES AND INTERLINK MODELS FOR MACRO-ECONOMIC SIMULATIONS

Description	B	D	E	F	I	NL	UK	EUR12[1]	% of EUR12 GDP Shock[2]	Interval[3]
I.CUSTOMS BARRIERS										
*Decrease in intra-EC import prices (in %)	1,46	1,53	1,71	1,84	2,04	1,55	1,58	1,7	-	-
*Employment decrease (thousands):										
-exporting firms	Distributed pro rata according to corresponding employment figures by country							17,5[4]	-	-
-customs clearing agents								40,0[4]	-	-
*Government employment decrease (in %)										
-customs officials	0,41	0,06	-	0,21	0,06	0,22	0,07	0,11	-	-
TOTAL SHOCK I (% GDP)	-	-	-	-	-	-	-	-	0,26	0,25-0,27
II.PUBLIC MARKETS										
*Increase of import penetration rate of public markets (% points)	8,2	8,5	-	5,5	4,1	-	3,9	5,6	0,22	-
*Price decrease of equipment goods on public markets (in %):										
-government	0,03	0,13	-	0,03	0,07	-	0,12	-	0,28	-
-public enterprises										
.energy	1,6	1,5	-	1,7	1,1	-	1,1	-		-
.transport and tele-communication	8,5	7,8	-	7,6	11,4	-	7,2	-		-
TOTAL SHOCK II (% GDP)	0,99	0,50	-	0,34	0,39	-	0,67	-	0,50	0,35-0,70
III. FINANCIAL MARKETS										
*Decrease in interest rate margins (% points):										
-short term households	0,7	2,2	0,7	1,8	2,6	0,6	1,9	1,9	-	-
-long term households	0,2	0,3	1,0	0,6	0	0	0	0,2	-	-
-long term firms[5]	1,2	0,2	0,2	0,5	0,7	0,9	0,4	0,5	-	-
*Decrease in price of financial services (in %):										
-private consumption	16,4	3,4	18,9	10,0	19,8	3,8	2,8	7,9	-	-
-intermediate con-sumption of firms	17,7	8,0	26,0	14,3	18,4	7,5	3,9	10,4	-	-
TOTAL SHOCK III (% GDP)	0,64	0,55	1,31	0,53	0,69	0,23	0,79	-	0,65	0,35-0,95

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Description	B	D	E	F	I	NL	UK	EUR12[1]	% of EUR12 GDP Shock[2]	Interval[3]
IV.SUPPLY EFFECTS										
1.Sectoral studies from consultants										
*Decrease in unit cost of production[6] (in %):										
-industry	-	1,24	-	1,75	1,69	-	1,12	-	0,97	-
*Decrease in price paid for business services by firms (in %)		Same shock for each country						1,26	0,13	-
Shock IV.1 (% GDP)	-	-	-	-	-	-	-	-	1,10	0,6-1,6
2.Economies of scale										
*Decrease in unit cost of production[7] (in %):										
-industry		Same shock for each country						1,52	-	-
Shock IV.2 (% GDP)	-	-	-	-	-		-	-	1,02	0,8-1,2
3.Pure competition effects										
*Decrease in production price (in %):										
-contraction of monopoly rents in industry		Same shock for each country						0,73	-	-
-reduction of X-inefficiency										
-industry								0,50	-	-
-market services								1,00	-	-
*Decrease in unit cost of production[8] (in %):										
-X-inefficiency										
.industry		Same shock for each country						0,50	-	-
.market services								1,00	-	-
Shock IV.3 (% GDP)	-	-	-	-	-	-	-	-	1,12	0,7-1,5
TOTAL SHOCK IV (% GDP)	-	-	-	-	-	-	-	-	3,24	2,1-4,3
TOTAL SHOCK OF PRIMARY EFFECTS									4,65	3,1-6,3

Notes:

1 EUR12 extrapolation of the weighted average of the analysed countries (N.B. differing units)

2 Nominal amount as a % of 1985 EUR12 GDP

3 Interval taking account of the precision margins indicated by the external consultants. For the supply effects, evaluation of the Commission's services.

4 Total EUR12

5 Net decrease including effects of capital market integration on interest rates.

6 Depending on the branch and the kind of effect (direct/indirect), the decreases in unit cost of production are obtained through a decrease in the cost of intermediate consumption, an ex-ante increase in the productivity of investments (marginal capital productivity) or an ex-ante increase in labour productivity

7 Obtained through an ex-ante increase in the productivity of investments (marginal capital productivity)

8 Obtained through an ex-ante increase in labour productivity

Source: Catinat and Italianer (1988)

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ANNEX 2 MAIN MACRO-ECONOMIC SIMULATION RESULTS BY AREA FOR INDIVIDUAL COUNTRIES[1]

Table A2.1: "Customs barriers" simulation: main macro-economic results for individual countries

CUSTOMS BARRIERS: BELGIUM

MODEL : HERMES

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
GROSS DOMESTIC PRODUCT	-0.06	0.13	0.21	0.26	0.30	0.34
PRIVATE CONSUMPTION PRICES	-0.45	-0.74	-0.94	-1.07	-1.17	-1.25
GDP DEFLATOR	0.15	-0.07	-0.25	-0.37	-0.47	-0.55
REAL WAGE RATE	0.02	0.08	0.11	0.11	0.11	0.10
LABOUR PRODUCTIVITY/HEAD	0.04	0.14	0.15	0.14	0.14	0.14
EMPLOYMENT % CHANGE	-0.10	-0.03	0.02	0.06	0.10	0.13
EMPLOYMENT ('000)	-4	-1	1	2	4	5
BUDGET SURPLUS % GDP, CHANGE	0.25	0.50	0.55	0.62	0.65	0.67
TRADE BALANCE % GDP, CHANGE	0.51	0.64	0.70	0.74	0.76	0.77

CUSTOMS BARRIERS: GERMANY

MODEL : HERMES

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
GROSS DOMESTIC PRODUCT	0.03	0.16	0.34	0.43	0.53	0.57
PRIVATE CONSUMPTION PRICES	-0.14	-0.36	-0.63	-0.90	-1.13	-1.27
GDP DEFLATOR	0.05	-0.21	-0.46	-0.72	-0.95	-1.10
REAL WAGE RATE	0.01	0.07	0.18	0.31	0.44	0.55
LABOUR PRODUCTIVITY/HEAD	0.08	0.17	0.24	0.23	0.25	0.23
EMPLOYMENT % CHANGE	-0.05	-0.00	0.10	0.20	0.29	0.34
EMPLOYMENT ('000)	-11	-1	25	52	74	89
BUDGET SURPLUS % GDP, CHANGE	0.02	0.05	0.11	0.15	0.19	0.21
TRADE BALANCE % GDP, CHANGE	0.15	0.10	0.08	0.05	0.03	0.03

CUSTOMS BARRIERS: FRANCE

MODEL : HERMES

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
GROSS DOMESTIC PRODUCT	-0.04	0.03	0.11	0.18	0.26	0.34
PRIVATE CONSUMPTION PRICES	-0.21	-0.39	-0.57	-0.74	-0.92	-1.09
GDP DEFLATOR	-0.05	-0.22	-0.41	-0.60	-0.79	-0.98
REAL WAGE RATE	0.08	0.06	0.05	0.06	0.08	0.10
LABOUR PRODUCTIVITY/HEAD	0.02	0.09	0.16	0.20	0.25	0.30
EMPLOYMENT % CHANGE	-0.09	-0.09	-0.07	-0.04	-0.01	0.03
EMPLOYMENT ('000)	-19	-19	-15	-9	-2	6
BUDGET SURPLUS % GDP, CHANGE	0.00	0.05	0.06	0.09	0.12	0.15
TRADE BALANCE % GDP, CHANGE	0.21	0.22	0.24	0.24	0.25	0.27

1 The top part of each table gives cumulative percentage deviations from the baseline projection, while the bottom part gives cumulative absolute deviations. See note at the end of Annex 4 for precise explanations.

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Table A2.1: Continued

CUSTOMS BARRIERS: ITALY

MODEL : HERMES

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
GROSS DOMESTIC PRODUCT	-0.05	0.10	0.19	0.23	0.25	0.24
PRIVATE CONSUMPTION PRICES	-0.23	-0.37	-0.48	-0.56	-0.63	-0.68
GDP DEFLATOR	-0.04	-0.16	-0.26	-0.33	-0.39	-0.43
REAL WAGE RATE	0.07	0.16	0.24	0.30	0.34	0.37
LABOUR PRODUCTIVITY/HEAD	-0.02	0.08	0.13	0.12	0.11	0.08
EMPLOYMENT % CHANGE	-0.05	-0.02	0.02	0.06	0.08	0.10
EMPLOYMENT ('000)	-10	-3	5	12	18	21
BUDGET SURPLUS % GDP, CHANGE	0.03	0.13	0.19	0.21	0.21	0.22
TRADE BALANCE % GDP, CHANGE	0.14	0.14	0.15	0.15	0.15	0.16

CUSTOMS BARRIERS: NETHERLANDS

MODEL : HERMES

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
GROSS DOMESTIC PRODUCT	-0.08	-0.02	0.11	0.22	0.35	0.45
PRIVATE CONSUMPTION PRICES	-0.09	-0.25	-0.44	-0.64	-0.81	-0.94
GDP DEFLATOR	0.38	0.13	-0.05	-0.23	-0.39	-0.51
REAL WAGE RATE	0.01	0.08	0.16	0.25	0.37	0.51
LABOUR PRODUCTIVITY/HEAD	0.07	0.17	0.26	0.27	0.29	0.29
EMPLOYMENT % CHANGE	-0.15	-0.19	-0.14	-0.05	0.06	0.15
EMPLOYMENT ('000)	-7	-9	-7	-2	3	8
BUDGET SURPLUS % GDP, CHANGE	0.07	0.01	0.08	0.16	0.26	0.32
TRADE BALANCE % GDP, CHANGE	0.36	0.22	0.18	0.14	0.12	0.11

CUSTOMS BARRIERS: UNITED KINGDOM

MODEL : HERMES

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
GROSS DOMESTIC PRODUCT	0.05	0.16	0.23	0.27	0.30	0.31
PRIVATE CONSUMPTION PRICES	-0.34	-0.65	-0.91	-1.06	-1.15	-1.21
GDP DEFLATOR	-0.19	-0.52	-0.80	-0.98	-1.08	-1.15
REAL WAGE RATE	0.13	0.14	0.17	0.17	0.18	0.18
LABOUR PRODUCTIVITY/HEAD	0.08	0.16	0.17	0.17	0.15	0.12
EMPLOYMENT % CHANGE	-0.03	0.02	0.08	0.13	0.17	0.20
EMPLOYMENT ('000)	-9	5	21	36	48	58
BUDGET SURPLUS % GDP, CHANGE	0.02	0.09	0.13	0.17	0.19	0.21
TRADE BALANCE % GDP, CHANGE	0.11	0.12	0.13	0.15	0.17	0.17

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Table A2.2: "Public procurement" simulation: main macro-economic results for individual countries

PUBLIC MARKETS WITH RESTRICTED OPENING: BELGIUM

MODEL : HERMES

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
GROSS DOMESTIC PRODUCT	0.79	0.94	0.85	0.79	0.76	0.78
PRIVATE CONSUMPTION PRICES	0.05	-0.04	-0.11	-0.17	-0.24	-0.30
GDP DEFLATOR	-0.29	-0.35	-0.42	-0.49	-0.52	-0.57
REAL WAGE RATE	0.03	0.20	-0.02	-0.21	-0.30	-0.31
LABOUR PRODUCTIVITY/HEAD	0.36	0.22	-0.02	-0.15	-0.19	-0.17
EMPLOYMENT % CHANGE	0.22	0.39	0.52	0.61	0.65	0.66
EMPLOYMENT ('000)	8	14	19	22	23	23
BUDGET SURPLUS % GDP, CHANGE	0.48	0.72	0.74	0.74	0.74	0.76
TRADE BALANCE % GDP, CHANGE	0.70	0.73	0.68	0.73	0.77	0.80

PUBLIC MARKETS WITH RESTRICTED OPENING: GERMANY

MODEL : HERMES

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
GROSS DOMESTIC PRODUCT	0.15	0.10	0.16	0.22	0.37	0.56
PRIVATE CONSUMPTION PRICES	-0.10	-0.23	-0.48	-0.90	-1.47	-2.15
GDP DEFLATOR	-0.09	-0.23	-0.43	-0.78	-1.27	-1.79
REAL WAGE RATE	0.01	0.06	0.10	0.13	0.22	0.37
LABOUR PRODUCTIVITY/HEAD	0.10	-0.02	0.05	0.11	0.21	0.29
EMPLOYMENT % CHANGE	0.05	0.12	0.11	0.11	0.17	0.27
EMPLOYMENT ('000)	12	29	27	29	43	70
BUDGET SURPLUS % GDP, CHANGE	0.11	0.10	0.09	0.11	0.14	0.23
TRADE BALANCE % GDP, CHANGE	0.10	0.10	0.11	0.11	0.10	0.15

PUBLIC MARKETS WITH RESTRICTED OPENING: FRANCE

MODEL : HERMES

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
GROSS DOMESTIC PRODUCT	0.24	0.34	0.38	0.41	0.45	0.50
PRIVATE CONSUMPTION PRICES	-0.06	-0.12	-0.19	-0.27	-0.35	-0.42
GDP DEFLATOR	-0.10	-0.20	-0.28	-0.36	-0.43	-0.49
REAL WAGE RATE	0.04	0.07	0.10	0.15	0.21	0.26
LABOUR PRODUCTIVITY/HEAD	0.20	0.24	0.23	0.22	0.22	0.24
EMPLOYMENT % CHANGE	0.04	0.10	0.15	0.19	0.23	0.26
EMPLOYMENT ('000)	9	22	33	42	50	57
BUDGET SURPLUS % GDP, CHANGE	0.07	0.18	0.24	0.28	0.33	0.37
TRADE BALANCE % GDP, CHANGE	0.17	0.25	0.27	0.26	0.26	0.26

.../...

Table A2.2: Continued

PUBLIC MARKETS WITH RESTRICTED OPENING: ITALY

MODEL : HERMES

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
GROSS DOMESTIC PRODUCT	0.29	0.28	0.28	0.30	0.33	0.39
PRIVATE CONSUMPTION PRICES	-0.04	-0.09	-0.15	-0.25	-0.35	-0.45
GDP DEFLATOR	-0.23	-0.31	-0.46	-0.62	-0.73	-0.84
REAL WAGE RATE	0.06	0.06	0.06	0.06	0.04	0.04
LABOUR PRODUCTIVITY/HEAD	0.20	0.15	0.12	0.13	0.13	0.15
EMPLOYMENT % CHANGE	0.06	0.10	0.13	0.15	0.18	0.20
EMPLOYMENT ('000)	13	21	27	32	37	44
BUDGET SURPLUS % GDP, CHANGE	0.18	0.24	0.18	0.20	0.20	0.19
TRADE BALANCE % GDP, CHANGE	0.07	0.07	0.04	0.03	0.03	0.02

PUBLIC MARKETS WITH RESTRICTED OPENING: UNITED KINGDOM

MODEL : HERMES

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
GROSS DOMESTIC PRODUCT	0.02	0.21	0.39	0.54	0.63	0.70
PRIVATE CONSUMPTION PRICES	-1.17	-1.72	-2.12	-2.44	-2.70	-2.92
GDP DEFLATOR	-1.11	-1.96	-2.58	-2.97	-3.22	-3.41
REAL WAGE RATE	0.61	0.23	0.24	0.31	0.37	0.42
LABOUR PRODUCTIVITY/HEAD	0.31	0.50	0.60	0.65	0.65	0.64
EMPLOYMENT % CHANGE	0.03	0.10	0.18	0.24	0.28	0.32
EMPLOYMENT ('000)	7	27	47	65	78	90
BUDGET SURPLUS % GDP, CHANGE	0.03	0.28	0.35	0.41	0.46	0.51
TRADE BALANCE % GDP, CHANGE	-0.57	-0.49	-0.47	-0.39	-0.33	-0.26

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Table A2.3: "Financial liberalisation" simulation: main macro-economic results for individual countries

FINANCIAL SERVICES: BELGIUM

MODEL : INTERLINK

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
GROSS DOMESTIC PRODUCT	0.50	0.97	1.19	1.21	1.20	1.22
PRIVATE CONSUMPTION PRICES	-0.91	-1.09	-1.27	-1.37	-1.37	-1.28
GDP DEFLATOR	-0.95	-1.12	-1.30	-1.40	-1.38	-1.27
REAL WAGE RATE	0.80	0.65	0.67	0.82	1.00	1.17
LABOUR PRODUCTIVITY/HEAD	0.45	0.74	0.72	0.64	0.65	0.69
EMPLOYMENT % CHANGE	0.04	0.23	0.46	0.56	0.55	0.52
EMPLOYMENT ('000)	2	9	17	21	20	19
BUDGET SURPLUS % GDP, CHANGE	0.34	0.56	0.70	0.88	0.92	0.97
TRADE BALANCE % GDP, CHANGE	-0.00	0.24	0.29	0.31	0.34	0.37

FINANCIAL SERVICES: GERMANY

MODEL : INTERLINK

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
GROSS DOMESTIC PRODUCT	0.50	0.92	0.89	0.71	0.75	0.96
PRIVATE CONSUMPTION PRICES	-0.24	-0.23	-0.12	-0.16	-0.32	-0.48
GDP DEFLATOR	-0.18	-0.05	0.16	0.16	0.03	-0.10
REAL WAGE RATE	0.30	0.58	0.61	0.57	0.59	0.66
LABOUR PRODUCTIVITY/HEAD	0.50	0.74	0.62	0.47	0.48	0.54
EMPLOYMENT % CHANGE	0.00	0.18	0.27	0.23	0.27	0.42
EMPLOYMENT ('000)	-0	45	69	60	70	108
BUDGET SURPLUS % GDP, CHANGE	0.11	0.33	0.45	0.46	0.50	0.63
TRADE BALANCE % GDP, CHANGE	-0.05	0.02	0.19	0.25	0.23	0.20

FINANCIAL SERVICES: SPAIN

MODEL : INTERLINK

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
GROSS DOMESTIC PRODUCT	0.45	0.81	0.92	0.86	0.77	0.71
PRIVATE CONSUMPTION PRICES	-1.22	-1.37	-1.44	-1.51	-1.56	-1.59
GDP DEFLATOR	-1.29	-1.42	-1.49	-1.56	-1.61	-1.65
REAL WAGE RATE	1.03	0.91	0.85	0.78	0.71	0.66
LABOUR PRODUCTIVITY/HEAD	0.66	1.08	1.09	1.00	0.93	0.89
EMPLOYMENT % CHANGE	-0.20	-0.27	-0.17	-0.13	-0.16	-0.18
EMPLOYMENT ('000)	-22	-28	-18	-15	-18	-21
BUDGET SURPLUS % GDP, CHANGE	0.01	-0.05	0.03	0.06	0.02	-0.01
TRADE BALANCE % GDP, CHANGE	-0.02	0.16	0.19	0.18	0.14	0.12

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Table A2.3: Continued

FINANCIAL SERVICES: FRANCE

MODEL : INTERLINK

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
GROSS DOMESTIC PRODUCT	0.46	0.80	1.17	1.43	1.63	1.77
PRIVATE CONSUMPTION PRICES	0.04	0.01	-0.18	-0.41	-0.65	-0.86
GDP DEFLATOR	0.08	0.08	-0.12	-0.35	-0.61	-0.83
REAL WAGE RATE	-0.03	-0.01	0.02	0.08	0.16	0.26
LABOUR PRODUCTIVITY/HEAD	0.49	0.76	1.02	1.19	1.30	1.36
EMPLOYMENT % CHANGE	-0.03	0.04	0.14	0.24	0.33	0.41
EMPLOYMENT ('000)	-6	8	30	51	70	87
BUDGET SURPLUS % GDP, CHANGE	0.08	0.26	0.49	0.76	1.02	1.23
TRADE BALANCE % GDP, CHANGE	-0.07	-0.05	0.01	0.05	0.10	0.15

FINANCIAL SERVICES: NETHERLANDS

MODEL : INTERLINK

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
GROSS DOMESTIC PRODUCT	0.28	0.73	0.98	0.97	0.91	0.85
PRIVATE CONSUMPTION PRICES	-0.39	-0.72	-1.00	-1.12	-1.03	-0.82
GDP DEFLATOR	-0.33	-0.68	-0.94	-1.04	-0.91	-0.66
REAL WAGE RATE	0.13	0.10	0.18	0.33	0.48	0.65
LABOUR PRODUCTIVITY/HEAD	0.23	0.46	0.41	0.23	0.19	0.26
EMPLOYMENT % CHANGE	0.05	0.27	0.57	0.74	0.72	0.59
EMPLOYMENT ('000)	2	12	27	35	34	28
BUDGET SURPLUS % GDP, CHANGE	-0.01	0.13	0.33	0.46	0.50	0.50
TRADE BALANCE % GDP, CHANGE	0.04	0.10	0.14	0.18	0.30	0.39

FINANCIAL SERVICES: ITALY

MODEL : INTERLINK

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
GROSS DOMESTIC PRODUCT	0.56	1.94	2.79	3.10	3.15	3.01
PRIVATE CONSUMPTION PRICES	-1.48	-2.78	-3.86	-4.40	-4.48	-4.19
GDP DEFLATOR	-1.56	-3.11	-4.38	-5.06	-5.26	-5.03
REAL WAGE RATE	0.51	0.33	0.21	0.12	-0.03	-0.14
LABOUR PRODUCTIVITY/HEAD	1.01	2.23	2.87	2.97	2.83	2.55
EMPLOYMENT % CHANGE	-0.45	-0.29	-0.08	0.13	0.31	0.45
EMPLOYMENT ('000)	-101	-66	-18	30	72	104
BUDGET SURPLUS % GDP, CHANGE	-0.08	0.49	1.30	1.80	2.20	2.50
TRADE BALANCE % GDP, CHANGE	0.00	-0.04	0.37	0.47	0.51	0.52

FINANCIAL SERVICES: UNITED KINGDOM

MODEL : INTERLINK

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
GROSS DOMESTIC PRODUCT	0.19	0.92	1.05	0.87	0.77	0.84
PRIVATE CONSUMPTION PRICES	-0.13	-0.34	-0.39	-0.44	-0.55	-0.74
GDP DEFLATOR	-0.12	-0.25	-0.21	-0.18	-0.24	-0.41
REAL WAGE RATE	-0.12	-0.19	-0.07	0.23	0.47	0.56
LABOUR PRODUCTIVITY/HEAD	0.61	1.09	0.85	0.51	0.44	0.53
EMPLOYMENT % CHANGE	-0.41	-0.17	0.21	0.35	0.33	0.31
EMPLOYMENT ('000)	-99	-40	51	89	83	78
BUDGET SURPLUS % GDP, CHANGE	-0.13	0.17	0.55	0.66	0.62	0.65
TRADE BALANCE % GDP, CHANGE	-0.02	-0.16	0.01	0.13	0.20	0.21

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Table A2.4: "Supply effects" simulation: main macro-economic results for individual countries

SUPPLY EFFECTS (TOTAL): GERMANY

MODEL : HERMES

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
GROSS DOMESTIC PRODUCT	0.53	0.79	1.18	1.52	1.86	2.10
PRIVATE CONSUMPTION PRICES	-0.26	-0.63	-1.07	-1.56	-1.98	-2.26
GDP DEFLATOR	-0.23	-0.60	-1.01	-1.48	-1.91	-2.21
REAL WAGE RATE	0.12	0.20	0.56	0.86	1.23	1.56
LABOUR PRODUCTIVITY/HEAD	0.84	0.94	1.16	1.27	1.39	1.45
EMPLOYMENT % CHANGE	-0.31	-0.16	0.03	0.26	0.47	0.65
EMPLOYMENT ('000)	-79	-40	7	66	123	170
BUDGET SURPLUS % GDP, CHANGE	-0.10	0.07	0.11	0.25	0.35	0.45
TRADE BALANCE % GDP, CHANGE	0.29	0.31	0.31	0.31	0.31	0.32

SUPPLY EFFECTS (TOTAL): FRANCE

MODEL : HERMES

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
GROSS DOMESTIC PRODUCT	0.43	0.81	1.22	1.63	2.08	2.45
PRIVATE CONSUMPTION PRICES	-0.78	-1.14	-1.49	-1.85	-2.21	-2.53
GDP DEFLATOR	-1.45	-1.85	-2.26	-2.65	-3.03	-3.33
REAL WAGE RATE	0.34	0.22	0.30	0.45	0.65	0.88
LABOUR PRODUCTIVITY/HEAD	0.66	0.90	1.15	1.34	1.53	1.64
EMPLOYMENT % CHANGE	-0.21	-0.07	0.11	0.34	0.60	0.87
EMPLOYMENT ('000)	-45	-16	25	75	132	192
BUDGET SURPLUS % GDP, CHANGE	-0.11	-0.08	0.11	0.32	0.59	0.89
TRADE BALANCE % GDP, CHANGE	0.10	0.15	0.30	0.43	0.54	0.66

SUPPLY EFFECTS (TOTAL): ITALY

MODEL : HERMES

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
GROSS DOMESTIC PRODUCT	0.54	0.93	1.28	1.52	1.68	1.82
PRIVATE CONSUMPTION PRICES	-0.55	-0.80	-1.06	-1.34	-1.56	-1.75
GDP DEFLATOR	-0.75	-1.01	-1.28	-1.57	-1.82	-2.04
REAL WAGE RATE	0.28	0.41	0.57	0.72	0.84	0.94
LABOUR PRODUCTIVITY/HEAD	0.75	0.95	1.07	1.12	1.11	1.10
EMPLOYMENT % CHANGE	-0.18	-0.01	0.19	0.37	0.51	0.64
EMPLOYMENT ('000)	-38	-3	40	77	110	139
BUDGET SURPLUS % GDP, CHANGE	0.15	0.50	0.50	0.61	0.68	0.73
TRADE BALANCE % GDP, CHANGE	0.13	0.20	0.22	0.25	0.30	0.34

SUPPLY EFFECTS (TOTAL): UNITED KINGDOM

MODEL : HERMES

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
GROSS DOMESTIC PRODUCT	0.55	1.15	1.62	1.91	2.08	2.15
PRIVATE CONSUMPTION PRICES	-0.91	-1.61	-2.15	-2.44	-2.55	-2.56
GDP DEFLATOR	-1.11	-1.99	-2.68	-3.02	-3.11	-3.09
REAL WAGE RATE	0.32	0.46	0.78	1.11	1.37	1.55
LABOUR PRODUCTIVITY/HEAD	0.79	1.20	1.48	1.61	1.65	1.62
EMPLOYMENT % CHANGE	-0.22	-0.03	0.18	0.35	0.48	0.56
EMPLOYMENT ('000)	-56	-8	48	96	132	159
BUDGET SURPLUS % GDP, CHANGE	0.02	0.18	0.29	0.37	0.41	0.43
TRADE BALANCE % GDP, CHANGE	0.14	0.22	0.31	0.38	0.45	0.48

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ANNEX 3 DETAILED MACRO-ECONOMIC SIMULATION RESULTS FOR EUR12, AGGREGATED AND BY AREA [1]

Table A3.1: Detailed aggregated macro-economic simulation results of the completion of the internal market for EUR 12

MODEL : HERMES/INTERLINK

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
PRIVATE CONSUMPTION	0.63	1.25	1.87	2.29	2.70	3.08
GOVERNMENT CONSUMPTION	0.85	0.83	0.88	0.95	1.03	1.11
GROSS FIXED CAP.FORMATION	2.26	3.66	4.44	5.09	5.36	5.39
* GOVERNMENT	0.00	0.00	0.00	0.00	0.00	0.00
* RESIDENTIAL	0.53	1.77	3.19	4.19	4.61	4.70
* FIRMS	3.68	5.47	6.19	6.78	7.01	7.03
EXPORTS OF GOODS AND SERVICES	3.43	5.49	7.43	8.60	9.64	10.52
IMPORTS OF GOODS AND SERVICES	2.93	4.37	5.36	6.05	6.67	7.21
GROSS DOMESTIC PRODUCT	1.13	2.31	3.16	3.64	4.10	4.52
PRIVATE CONSUMPTION PRICES	-1.58	-2.68	-3.71	-4.66	-5.49	-6.16
EXPORT PRICES	-0.85	-2.01	-3.33	-4.31	-5.04	-5.58
IMPORT PRICES	-1.33	-2.12	-3.15	-3.93	-4.49	-4.96
NOMINAL WAGE RATE	-1.01	-2.15	-2.88	-3.43	-3.80	-4.02
REAL WAGE RATE	0.77	0.80	1.11	1.48	1.86	2.22
TERMS OF TRADE	0.47	0.11	-0.19	-0.38	-0.54	-0.62
GDP DEFLATOR	-1.68	-2.93	-4.04	-5.02	-5.84	-6.45
EMPLOYMENT ('000)	-533	-40	552	1043	1462	1866
EMPLOYMENT % CHANGE	-0.44	-0.03	0.45	0.83	1.16	1.47
UNEMPLOYMENT ('000)	464	13	-396	-746	-994	-1255
UNEMPLOYMENT RATE, CHANGE	0.27	0.02	-0.26	-0.30	-0.56	-0.68
LABOUR PRODUCTIVITY/HEAD	1.57	2.35	2.72	2.81	2.95	3.04
UTILIZATION RATE INDUSTRY	0.88	1.72	2.11	2.20	2.33	2.47
BUDGET SURPLUS (BN 1985 ECU)	4.341	23.886	39.311	52.000	62.609	73.464
BUDGET SURPLUS % GDP, CHANGE	0.13	0.72	1.19	1.57	1.89	2.22
TRADE BALANCE (BN 1985 ECU)	10.080	12.946	20.800	25.324	28.555	31.578
TRADE BALANCE % GDP, CHANGE	0.30	0.39	0.63	0.76	0.86	0.95
GR. OP. SURPLUS % GDP, CHANGE	0.52	0.73	0.55	0.21	-0.08	-0.35
REAL DISP. INCOME HOUSEHOLDS	0.91	1.43	2.00	2.32	2.65	2.94

1 The top part of each table gives cumulative percentage deviations from the baseline projection, while the bottom part gives cumulative absolute deviations. See note at the end of Annex 4 for precise explanations.

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Table A3.2: "Customs barriers" simulation: detailed macro-economic results for EUR 12

MODEL : HERMES

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
PRIVATE CONSUMPTION	0.09	0.17	0.24	0.30	0.36	0.40
GOVERNMENT CONSUMPTION	-0.10	-0.10	-0.09	-0.07	-0.06	-0.04
GROSS FIXED CAP.FORMATION	0.01	0.15	0.30	0.40	0.47	0.47
* GOVERNMENT	0.00	0.00	0.00	0.00	0.00	0.00
* RESIDENTIAL	0.04	0.11	0.21	0.30	0.36	0.38
* FIRMS	-0.00	0.19	0.38	0.49	0.56	0.55
EXPORTS OF GOODS AND SERVICES	0.21	0.47	0.69	0.82	0.92	1.00
IMPORTS OF GOODS AND SERVICES	0.36	0.64	0.85	0.95	1.03	1.06
GROSS DOMESTIC PRODUCT	-0.01	0.10	0.20	0.27	0.33	0.36
PRIVATE CONSUMPTION PRICES	-0.21	-0.41	-0.61	-0.78	-0.92	-1.02
EXPORT PRICES	-0.11	-0.39	-0.58	-0.72	-0.83	-0.91
IMPORT PRICES	-0.88	-1.12	-1.27	-1.36	-1.41	-1.45
NOMINAL WAGE RATE	-0.15	-0.33	-0.47	-0.58	-0.66	-0.72
REAL WAGE RATE	0.06	0.10	0.15	0.20	0.25	0.29
TERMS OF TRADE	0.78	0.74	0.70	0.65	0.60	0.55
GDP DEFLATOR	-0.01	-0.23	-0.42	-0.60	-0.74	-0.85
EMPLOYMENT ('000)	-67	-32	33	102	164	211
EMPLOYMENT % CHANGE	-0.06	-0.03	0.03	0.08	0.13	0.16
UNEMPLOYMENT ('000)	46	12	-31	-77	-117	-148
UNEMPLOYMENT RATE, CHANGE	0.02	0.01	-0.01	-0.02	-0.03	-0.04
LABOUR PRODUCTIVITY/HEAD	0.04	0.12	0.17	0.17	0.18	0.17
UTILIZATION RATE INDUSTRY	-0.03	0.07	0.12	0.14	0.15	0.15
BUDGET SURPLUS (BN 1985 ECU)	.920	2.661	4.139	5.209	6.185	6.942
BUDGET SURPLUS % GDP, CHANGE	0.03	0.08	0.12	0.16	0.19	0.21
TRADE BALANCE (BN 1985 ECU)	5.605	5.184	5.202	5.139	5.163	5.283
TRADE BALANCE % GDP, CHANGE	0.17	0.16	0.16	0.16	0.16	0.16
GR. OP. SURPLUS % GDP, CHANGE	0.08	0.10	0.10	0.08	0.06	0.04
REAL DISP. INCOME HOUSEHOLDS	0.13	0.19	0.24	0.28	0.31	0.33

Table A3.3: "Public procurement" simulation: detailed macro-economic results for EUR 12

MODEL : HERMES

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
PRIVATE CONSUMPTION	0.16	0.18	0.23	0.28	0.35	0.46
GOVERNMENT CONSUMPTION	0.71	0.69	0.68	0.68	0.69	0.70
GROSS FIXED CAP.FORMATION	0.27	0.37	0.49	0.61	0.75	0.88
* GOVERNMENT	0.00	0.00	0.00	0.00	0.00	0.00
* RESIDENTIAL	0.15	0.44	0.70	0.88	1.02	1.15
* FIRMS	0.38	0.47	0.59	0.73	0.89	1.05
EXPORTS OF GOODS AND SERVICES	1.59	1.71	1.76	1.81	1.91	2.02
IMPORTS OF GOODS AND SERVICES	1.95	1.86	1.84	1.88	2.00	2.13
GROSS DOMESTIC PRODUCT	0.20	0.25	0.31	0.37	0.45	0.55
PRIVATE CONSUMPTION PRICES	-0.30	-0.48	-0.67	-0.91	-1.17	-1.46
EXPORT PRICES	0.04	-0.12	-0.36	-0.63	-0.90	-1.11
IMPORT PRICES	-0.10	-0.18	-0.37	-0.65	-0.95	-1.23
NOMINAL WAGE RATE	-0.16	-0.43	-0.62	-0.82	-1.03	-1.25
REAL WAGE RATE	0.18	0.11	0.12	0.15	0.20	0.26
TERMS OF TRADE	0.13	0.05	0.02	0.02	0.05	0.12
GDP DEFLATOR	-0.35	-0.62	-0.86	-1.11	-1.35	-1.58
EMPLOYMENT ('000)	62	143	192	238	290	356
EMPLOYMENT % CHANGE	0.05	0.12	0.15	0.19	0.23	0.28
UNEMPLOYMENT ('000)	-48	-97	-118	-149	-179	-222
UNEMPLOYMENT RATE, CHANGE	-0.03	-0.05	-0.07	-0.09	-0.10	-0.11
LABOUR PRODUCTIVITY/HEAD	0.15	0.13	0.16	0.18	0.23	0.27
UTILIZATION RATE INDUSTRY	0.09	0.14	0.17	0.19	0.19	0.19
BUDGET SURPLUS (BN 1985 ECU)	3.687	7.006	7.526	8.555	9.658	11.108
BUDGET SURPLUS % GDP, CHANGE	0.11	0.21	0.23	0.26	0.29	0.34
TRADE BALANCE (BN 1985 ECU)	-.331	.814	1.046	1.594	1.988	2.869
TRADE BALANCE % GDP, CHANGE	-0.01	0.02	0.03	0.05	0.06	0.09
GR. OP. SURPLUS % GDP, CHANGE	0.15	0.09	0.04	0.02	0.01	0.01
REAL DISP. INCOME HOUSEHOLDS	0.22	0.19	0.23	0.28	0.34	0.43

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Table A3.4: "Financial liberalisation" simulation: detailed macro-economic results for EUR 12

MODEL : INTERLINK

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
PRIVATE CONSUMPTION	0.24	0.59	0.80	0.86	0.90	0.95
GOVERNMENT CONSUMPTION	0.00	0.00	0.00	0.00	0.00	0.00
GROSS FIXED CAP.FORMATION	1.63	2.47	2.60	2.72	2.58	2.42
* GOVERNMENT	0.00	0.00	0.00	0.00	0.00	0.00
* RESIDENTIAL	0.28	1.05	1.78	2.18	2.14	1.97
* FIRMS	2.81	3.90	3.85	3.84	3.61	3.43
EXPORTS OF GOODS AND SERVICES	0.37	1.04	1.79	2.01	2.11	2.21
IMPORTS OF GOODS AND SERVICES	0.40	0.94	1.18	1.24	1.19	1.23
GROSS DOMESTIC PRODUCT	0.43	1.06	1.33	1.36	1.39	1.46
PRIVATE CONSUMPTION PRICES	-0.47	-0.78	-1.01	-1.19	-1.32	-1.38
EXPORT PRICES	-0.24	-0.52	-0.97	-1.15	-1.20	-1.24
IMPORT PRICES	-0.18	-0.37	-0.81	-1.02	-1.07	-1.11
NOMINAL WAGE RATE	-0.33	-0.68	-0.91	-1.02	-1.06	-1.02
REAL WAGE RATE	0.26	0.26	0.28	0.33	0.38	0.42
TERMS OF TRADE	-0.07	-0.14	-0.16	-0.13	-0.13	-0.13
GDP DEFLATOR	-0.47	-0.77	-1.00	-1.17	-1.31	-1.37
EMPLOYMENT ('000)	-245	-65	171	294	361	440
EMPLOYMENT % CHANGE	-0.20	-0.05	0.14	0.24	0.29	0.36
UNEMPLOYMENT ('000)	250	77	-151	-261	-311	-377
UNEMPLOYMENT RATE, CHANGE	0.18	0.05	-0.11	-0.05	-0.23	-0.28
LABOUR PRODUCTIVITY/HEAD	0.63	1.11	1.19	1.12	1.10	1.11
UTILIZATION RATE INDUSTRY	0.36	0.76	0.83	0.72	0.68	0.72
BUDGET SURPLUS (BN 1985 ECU)	.566	9.367	19.926	26.003	30.368	34.988
BUDGET SURPLUS % GDP, CHANGE	0.02	0.28	0.60	0.78	0.92	1.06
TRADE BALANCE (BN 1985 ECU)	-1.012	-.580	4.973	7.160	8.196	8.599
TRADE BALANCE % GDP, CHANGE	-0.03	-0.02	0.15	0.22	0.25	0.26
GR. OP. SURPLUS % GDP, CHANGE	0.20	0.40	0.29	0.06	-0.15	-0.32
REAL DISP. INCOME HOUSEHOLDS	0.31	0.68	0.82	0.83	0.85	0.88

Table A3.5: "Supply effects" simulation: detailed macro-economic results for EUR 12

MODEL : HERMES

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
PRIVATE CONSUMPTION	0.15	0.32	0.60	0.85	1.08	1.27
GOVERNMENT CONSUMPTION	0.24	0.24	0.29	0.34	0.40	0.45
GROSS FIXED CAP.FORMATION	0.35	0.67	1.04	1.35	1.56	1.63
* GOVERNMENT	0.00	0.00	0.00	0.00	0.00	0.00
* RESIDENTIAL	0.05	0.17	0.50	0.82	1.09	1.21
* FIRMS	0.50	0.92	1.37	1.73	1.96	2.01
EXPORTS OF GOODS AND SERVICES	1.26	2.27	3.19	3.96	4.70	5.29
IMPORTS OF GOODS AND SERVICES	0.22	0.92	1.49	1.97	2.45	2.79
GROSS DOMESTIC PRODUCT	0.51	0.90	1.31	1.64	1.93	2.14
PRIVATE CONSUMPTION PRICES	-0.60	-1.01	-1.41	-1.78	-2.08	-2.29
EXPORT PRICES	-0.54	-0.98	-1.43	-1.80	-2.11	-2.33
IMPORT PRICES	-0.17	-0.45	-0.70	-0.90	-1.06	-1.17
NOMINAL WAGE RATE	-0.36	-0.72	-0.89	-1.01	-1.05	-1.03
REAL WAGE RATE	0.26	0.32	0.56	0.80	1.04	1.25
TERMS OF TRADE	-0.37	-0.53	-0.73	-0.90	-1.05	-1.16
GDP DEFLATOR	-0.85	-1.32	-1.76	-2.14	-2.44	-2.65
EMPLOYMENT ('000)	-284	-86	156	409	647	859
EMPLOYMENT % CHANGE	-0.23	-0.07	0.13	0.33	0.51	0.68
UNEMPLOYMENT ('000)	215	20	-97	-259	-387	-509
UNEMPLOYMENT RATE, CHANGE	0.09	0.01	-0.07	-0.14	-0.20	-0.25
LABOUR PRODUCTIVITY/HEAD	0.75	0.97	1.18	1.31	1.42	1.47
UTILIZATION RATE INDUSTRY	0.46	0.75	0.99	1.16	1.31	1.40
BUDGET SURPLUS (BN 1985 ECU)	-.832	4.851	7.720	12.233	16.399	20.426
BUDGET SURPLUS % GDP, CHANGE	-0.03	0.15	0.23	0.37	0.49	0.62
TRADE BALANCE (BN 1985 ECU)	5.817	7.528	9.578	11.432	13.209	14.828
TRADE BALANCE % GDP, CHANGE	0.18	0.23	0.29	0.34	0.40	0.45
GR. OP. SURPLUS % GDP, CHANGE	0.09	0.14	0.11	0.05	-0.01	-0.09
REAL DISP. INCOME HOUSEHOLDS	0.25	0.38	0.70	0.93	1.14	1.29

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ANNEX 4 DETAILED AGGREGATED MACRO-ECONOMIC SIMULATION RESULTS OF THE COMPLETION OF THE INTERNAL MARKET FOR GERMANY, FRANCE, ITALY AND THE UNITED KINGDOM [1]

Table A4.1: Detailed aggregated macro-economic simulation results of the completion of the internal market for Germany

MODEL : HERMES/INTERLINK

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
PRIVATE CONSUMPTION	0.49	1.11	1.65	2.14	2.82	3.59
GOVERNMENT CONSUMPTION	-0.24	-0.10	0.07	0.28	0.49	0.67
GROSS FIXED CAP.FORMATION	1.74	2.63	3.65	4.34	4.88	5.21
* GOVERNMENT	0.00	0.00	0.00	0.00	0.00	0.00
* RESIDENTIAL	0.63	1.49	2.15	2.46	2.67	2.89
* FIRMS	2.72	3.68	4.98	5.84	6.54	6.93
EXPORTS OF GOODS AND SERVICES	3.10	4.72	6.27	6.95	7.69	8.33
IMPORTS OF GOODS AND SERVICES	2.42	3.52	4.70	5.43	6.16	6.89
GROSS DOMESTIC PRODUCT	1.22	1.97	2.57	2.89	3.52	4.20
PRIVATE CONSUMPTION PRICES	-0.74	-1.46	-2.30	-3.52	-4.90	-6.16
EXPORT PRICES	-0.21	-1.38	-2.65	-3.82	-4.94	-5.77
IMPORT PRICES	-1.04	-1.78	-3.02	-4.10	-5.01	-5.86
NOMINAL WAGE RATE	-0.29	-0.50	-0.81	-1.62	-2.41	-3.00
REAL WAGE RATE	0.44	0.91	1.44	1.87	2.48	3.14
TERMS OF TRADE	0.84	0.40	0.37	0.29	0.07	0.10
GDP DEFLATOR	-0.45	-1.09	-1.74	-2.82	-4.10	-5.20
EMPLOYMENT ('000)	-78	34	129	208	311	438
EMPLOYMENT % CHANGE	-0.31	0.14	0.50	0.80	1.19	1.68
UNEMPLOYMENT ('000)	78	-65	-108	-184	-260	-373
UNEMPLOYMENT RATE, CHANGE	0.00	-0.15	-0.22	-0.20	-0.24	-0.36
LABOUR PRODUCTIVITY/HEAD	1.53	1.84	2.07	2.08	2.32	2.51
UTILIZATION RATE INDUSTRY	0.57	1.01	0.91	0.64	0.65	0.83
BUDGET SURPLUS (BN 1985 ECU)	1.070	4.562	6.330	7.891	9.714	12.575
BUDGET SURPLUS % GDP, CHANGE	0.13	0.55	0.77	0.95	1.18	1.52
TRADE BALANCE (BN 1985 ECU)	4.058	4.413	5.661	6.029	5.627	5.776
TRADE BALANCE % GDP, CHANGE	0.49	0.53	0.69	0.73	0.68	0.70
GR. OP. SURPLUS % GDP, CHANGE	0.66	0.64	0.56	0.41	0.29	0.15
REAL DISP. INCOME HOUSEHOLDS	0.95	1.31	1.91	2.19	2.73	3.27

Table A4.2: Detailed aggregated macro-economic simulation results of the completion of the internal market for France

MODEL : HERMES/INTERLINK

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
PRIVATE CONSUMPTION	0.24	0.65	1.04	1.50	1.97	2.41
GOVERNMENT CONSUMPTION	0.58	0.44	0.54	0.70	0.89	1.10
GROSS FIXED CAP.FORMATION	4.07	5.27	5.95	6.45	6.73	6.79
* GOVERNMENT	0.00	0.00	0.00	0.00	0.00	0.00
* RESIDENTIAL	0.40	1.28	2.85	4.31	5.62	6.59
* FIRMS	6.86	8.46	9.02	9.30	9.21	8.85
EXPORTS OF GOODS AND SERVICES	4.21	6.79	9.30	11.01	12.79	14.47
IMPORTS OF GOODS AND SERVICES	3.45	5.80	7.30	8.18	9.05	9.59
GROSS DOMESTIC PRODUCT	1.09	1.97	2.88	3.65	4.41	5.05
PRIVATE CONSUMPTION PRICES	-1.00	-1.64	-2.43	-3.27	-4.12	-4.89
EXPORT PRICES	-0.80	-1.52	-2.71	-3.71	-4.52	-5.18
IMPORT PRICES	-1.55	-2.43	-3.32	-3.88	-4.31	-4.64
NOMINAL WAGE RATE	-0.57	-1.28	-1.90	-2.45	-2.92	-3.25
REAL WAGE RATE	0.43	0.34	0.48	0.74	1.09	1.51
TERMS OF TRADE	0.76	0.93	0.63	0.20	-0.19	-0.53
GDP DEFLATOR	-1.53	-2.19	-3.07	-3.97	-4.86	-5.63
EMPLOYMENT ('000)	-60	-5	73	159	250	342
EMPLOYMENT % CHANGE	-0.28	-0.02	0.34	0.73	1.15	1.57
UNEMPLOYMENT ('000)	33	5	-35	-80	-128	-178
UNEMPLOYMENT RATE, CHANGE	0.15	0.02	-0.16	-0.37	-0.57	-0.79
LABOUR PRODUCTIVITY/HEAD	1.37	2.00	2.56	2.95	3.30	3.54
UTILIZATION RATE INDUSTRY	1.37	2.07	2.90	3.56	4.25	4.74
BUDGET SURPLUS (BN 1985 ECU)	.262	2.727	6.073	9.761	13.860	17.788
BUDGET SURPLUS % GDP, CHANGE	0.04	0.40	0.90	1.45	2.05	2.64
TRADE BALANCE (BN 1985 ECU)	2.806	3.872	5.517	6.603	7.787	9.110
TRADE BALANCE % GDP, CHANGE	0.42	0.57	0.82	0.98	1.15	1.35
GR. OP. SURPLUS % GDP, CHANGE	0.24	0.59	0.69	0.55	0.29	-0.03
REAL DISP. INCOME HOUSEHOLDS	0.30	0.78	1.12	1.56	1.99	2.41

1 See note at the end of this Annex

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Table A4.3: Detailed aggregated macro-economic simulation results of the completion of the internal market for Italy

MODEL : HERMES/INTERLINK

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
PRIVATE CONSUMPTION	0.85	1.85	2.98	3.53	3.75	3.79
GOVERNMENT CONSUMPTION	-0.05	-0.05	-0.06	-0.07	-0.07	-0.08
GROSS FIXED CAP.FORMATION	2.10	4.42	5.06	6.48	6.88	6.93
* GOVERNMENT	0.00	0.00	0.00	0.00	0.00	0.00
* RESIDENTIAL	0.33	2.20	5.24	7.23	6.95	5.70
* FIRMS	3.54	6.82	6.58	8.11	8.93	9.58
EXPORTS OF GOODS AND SERVICES	3.62	5.94	8.55	10.15	11.40	12.28
IMPORTS OF GOODS AND SERVICES	2.05	3.85	4.47	5.39	5.98	6.61
GROSS DOMESTIC PRODUCT	1.35	3.25	4.54	5.15	5.41	5.46
PRIVATE CONSUMPTION PRICES	-2.30	-4.04	-5.55	-6.55	-7.02	-7.07
EXPORT PRICES	-1.85	-3.17	-5.11	-6.33	-6.99	-7.34
IMPORT PRICES	-1.82	-2.97	-4.28	-5.25	-5.78	-6.08
NOMINAL WAGE RATE	-1.68	-3.46	-4.84	-5.62	-5.92	-5.77
REAL WAGE RATE	0.91	0.96	1.07	1.19	1.19	1.21
TERMS OF TRADE	-0.02	-0.19	-0.83	-1.09	-1.22	-1.26
GDP DEFLATOR	-2.58	-4.59	-6.38	-7.58	-8.19	-8.34
EMPLOYMENT ('000)	-136	-50	53	150	236	308
EMPLOYMENT % CHANGE	-0.62	-0.22	0.26	0.70	1.08	1.40
UNEMPLOYMENT ('000)	131	66	-16	-92	-157	-208
UNEMPLOYMENT RATE, CHANGE	0.53	0.25	-0.10	-0.41	-0.66	-0.87
LABOUR PRODUCTIVITY/HEAD	1.94	3.41	4.20	4.34	4.18	3.89
UTILIZATION RATE INDUSTRY	0.86	1.26	1.33	1.25	1.13	1.03
BUDGET SURPLUS (BN 1985 ECU)	1.569	7.559	12.101	15.708	18.370	20.293
BUDGET SURPLUS % GDP, CHANGE	0.28	1.36	2.17	2.82	3.30	3.65
TRADE BALANCE (BN 1985 ECU)	1.900	2.040	4.376	5.001	5.541	5.743
TRADE BALANCE % GDP, CHANGE	0.34	0.37	0.79	0.90	1.00	1.03
GR. OP. SURPLUS % GDP, CHANGE	0.27	0.47	0.01	-0.64	-1.28	-1.89
REAL DISP. INCOME HOUSEHOLDS	1.07	1.98	2.92	3.32	3.46	3.50

Table A 4.4: Detailed aggregated macro-economic simulation results of the completion of the internal market for the United Kingdom

MODEL : HERMES/INTERLINK

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
PRIVATE CONSUMPTION	1.10	1.75	2.29	2.54	2.73	2.91
GOVERNMENT CONSUMPTION	2.86	2.80	2.74	2.67	2.61	2.55
GROSS FIXED CAP.FORMATION	1.69	3.34	4.10	4.26	3.93	3.42
* GOVERNMENT	0.00	0.00	0.00	0.00	0.00	0.00
* RESIDENTIAL	0.55	2.48	3.57	4.17	4.57	4.73
* FIRMS	2.79	4.75	5.90	5.66	4.93	4.13
EXPORTS OF GOODS AND SERVICES	2.50	4.43	6.14	7.31	8.07	8.57
IMPORTS OF GOODS AND SERVICES	4.11	4.96	5.01	5.14	5.30	5.48
GROSS DOMESTIC PRODUCT	0.81	2.44	3.29	3.59	3.79	4.00
PRIVATE CONSUMPTION PRICES	-2.55	-4.33	-5.57	-6.39	-6.96	-7.43
EXPORT PRICES	-1.10	-2.67	-3.96	-4.57	-4.89	-5.21
IMPORT PRICES	-1.33	-1.89	-2.57	-3.10	-3.45	-3.74
NOMINAL WAGE RATE	-1.64	-3.70	-4.46	-4.55	-4.56	-4.73
REAL WAGE RATE	0.94	0.65	1.12	1.83	2.40	2.71
TERMS OF TRADE	0.23	-0.78	-1.39	-1.48	-1.44	-1.47
GDP DEFLATOR	-2.52	-4.72	-6.26	-7.14	-7.66	-8.06
EMPLOYMENT ('000)	-157	-16	167	285	342	385
EMPLOYMENT % CHANGE	-0.64	-0.08	0.65	1.07	1.26	1.39
UNEMPLOYMENT ('000)	135	10	-136	-207	-219	-223
UNEMPLOYMENT RATE, CHANGE	0.50	0.05	-0.48	-0.07	-0.79	-0.79
LABOUR PRODUCTIVITY/HEAD	1.79	2.95	3.10	2.93	2.89	2.91
UTILIZATION RATE INDUSTRY	0.65	2.62	3.45	3.53	3.48	3.46
BUDGET SURPLUS (BN 1985 ECU)	-.338	4.232	7.865	9.563	10.045	10.707
BUDGET SURPLUS % GDP, CHANGE	-0.06	0.71	1.32	1.61	1.69	1.80
TRADE BALANCE (BN 1985 ECU)	-1.987	-1.883	-.130	1.645	2.907	3.601
TRADE BALANCE % GDP, CHANGE	-0.33	-0.32	-0.02	0.28	0.49	0.61
GR. OP. SURPLUS % GDP, CHANGE	1.13	1.52	1.03	0.39	-0.01	-0.21
REAL DISP. INCOME HOUSEHOLDS	1.17	1.68	2.11	2.34	2.60	2.80

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Note to Annexes 2, 3 and 4:

The figures in the tables represent cumulative deviations from a baseline simulation. The table below indicates which variables are expressed in percentage deviations, and which variables are expressed in absolute differences.

List of variables

Volumes		
Private consumption	Percentage difference	
Government consumption	" "	
Gross fixed capital formation	" "	
- Government	" "	
- Residential	" "	
- Firms	" "	
Exports of goods and services	" "	
Imports of goods and services	" "	
Gross domestic product	" "	
Prices		
Private consumption price	" "	
Export price	" "	
Import price	" "	
Nominal wage rate	" "	
Real wage rate	" "	
Terms of trade	" "	
GDP deflator	" "	
Other		
Employment ('000)	Absolute difference	
Employment % change	Percentage difference	
Unemployment ('000)	Absolute difference	
Unemployment rate, change	" "	(% points)
Labour productivity/head	Percentage difference	
Utilization rate industry	Absolute difference	(% points)
Budget surplus (BN 1985 ECU)	" "	
Budget surplus % GDP, change	" "	(% points)
Trade balance (BN 1985 ECU)	" "	
Trade balance % GDP, change	" "	(% points)
Gr.op.surplus % GDP, change	" "	(% points)
Real disp.income households	Percentage difference	

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ANNEX 5 LIST OF STUDIES

This annex provides the list of studies carried out by external consultants or universities and used for the simulations.

Studies concerning specific types of barrier

1. "The Cost of Non-Europe: Customs Barriers"
   Ernst & Whinney

2. "The Cost of Non-Europe in Public Sector Procurement"
   W.S. Atkins Management Consultants

Studies concerning specific industries

3. "The Cost of Non-Europe in the Foodstuffs Industry"
   Groupe MAC

4. "The Cost of Non-Europe: the Pharmaceutical Industry"
   Economists Advisory Group

5. "The benefit of True-Europe in the EC Automobile Sector"
   Ludwigsen Associates Limited

6. "The Cost of Non-Europe in the Textile-Clothing Industry"
   IFO-Institut für Wirtschaftsforschung, and Prometeia Calcolo Srl.

7. "Le coût de la Non-Europe des produits de construction"
   BIPE - Bureau d'informations et de prévisions économiques

Studies concerning specific service sectors

8. "The Cost of Non-Europe in Financial Services"
   Price Waterhouse Economic and Management Consultants

9. "The Cost of Non-Europe for Business Services"
   Peat, Marwick, McLintock

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Studies based on particular analytical approaches

10. "The Completion of the Internal Market: a Survey of European Industry's Perception of the Likely Effects"
G. Nerb, Directorate-General for Economic and Financial Affairs, Commission of the European Communities

11. "A Survey of the Economies of Scale"
C. Pratten, Department of Applied Economics, University of Cambridge

12. "Economies of Scale and Intra-Community Trade"
J. Schwalbach, International Institute for Management

13. "The Costs of Non-Europe: An Assessment based on a Formal Model of Imperfect Competition and Economies of Scale"
A. Smith, University of Southampton, and A. Venables, University of Sussex

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ANNEXES

ANNEXE

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ANNEX

PRESENTATION OF

THE "RESEARCH ON THE COST OF NON-EUROPE"

Annex 1: The structure of the Research

Annex 2: The publication programme

ANNEX 1

THE RESEARCH ON THE "COST OF NON-EUROPE"

The purpose of the research was to provide a solid body of scientific analysis regarding the costs of European market fragmentation, and thus the benefits on offer following the removal of barriers targetted by the Commission's White Paper on "Completing the internal market", which was adopted by the European Community summit in 1985.

A preliminary to embarking on the research was the establishment of a steering committee, bringing together the multi-faceted expertise needed to effectively oversee the project and the reports undertaken for it by independent consultants. As its name suggests, the committee helped to steer a course through the uncharted seas of inexistent basic data and methodologies. Its combination of Commission civil servants, mainly drawn from the two most directly concerned departments (directorates-general II and III), and leading outside experts proved to be a determining asset in the success of the operation.

At the outset, the committee opted to make two key choices :

- to limit the scope of the "non-Europe" research to the market and trade barriers to be eliminated by the White Paper programme;

- to ensure that the coverage of the individual studies, which were to be launched in the course of the project, included the four major Community countries, while leaving open the possibility of extending this geographical scope on a case by case basis.

In carrying out the research, whose structure and main participants are outlined below, these two choices have been applied with due flexibility. In particular, the need to achieve as broad a geographical coverage as possible has been satisfied both in many of the individual studies and in the industrial survey in which 11,000 enterprises across the Community actively participated; and, perhaps more significantly still, by the aggregate economic estimates to be found in Part II. In addition, to ensure maximum coherence in the methodological approach adopted by the project and in the presentation of its results, two symposia were held between the Commission and the independent consultants in respectively May and October 1987.

Since the outset of the research, the steering committee gave special emphasis to the need to develop analytic tools which would enable identification and quantitative evaluation of the dynamic effects generated by the elimination of non-tariff barriers - effects which, it was strongly felt, would provide the most significant contribution to the resultant welfare benefits. These tools were developed in the early months of the research, when the first sketch of what was to become the methodology used in the macro-economic analysis was outlined. The same effort was made for the micro-economic analysis, starting with a round table of leading economists on economies of scale.

This book represents the most visible part of the results of the research project. In the interests of wider circulation, it does not treat in detail the methodology used to obtain the results, nor does it report all the findings of the basic studies carried out by the consultants. Appendix II supplies the list of publications in which the detailed results of the research can be found.

Criticism is expected and welcome. Such an enterprise cannot be immune to imperfection and even perhaps error. However the overall outcome of the research, which points to very significant gains to be derived from European market integration, seem to be both, accurate and reasonable. It is highly unlikely that the intellectual input of so many leading consultants, academics, officials and independent experts would be unanimously pointing in the wrong direction.

Annex 2

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