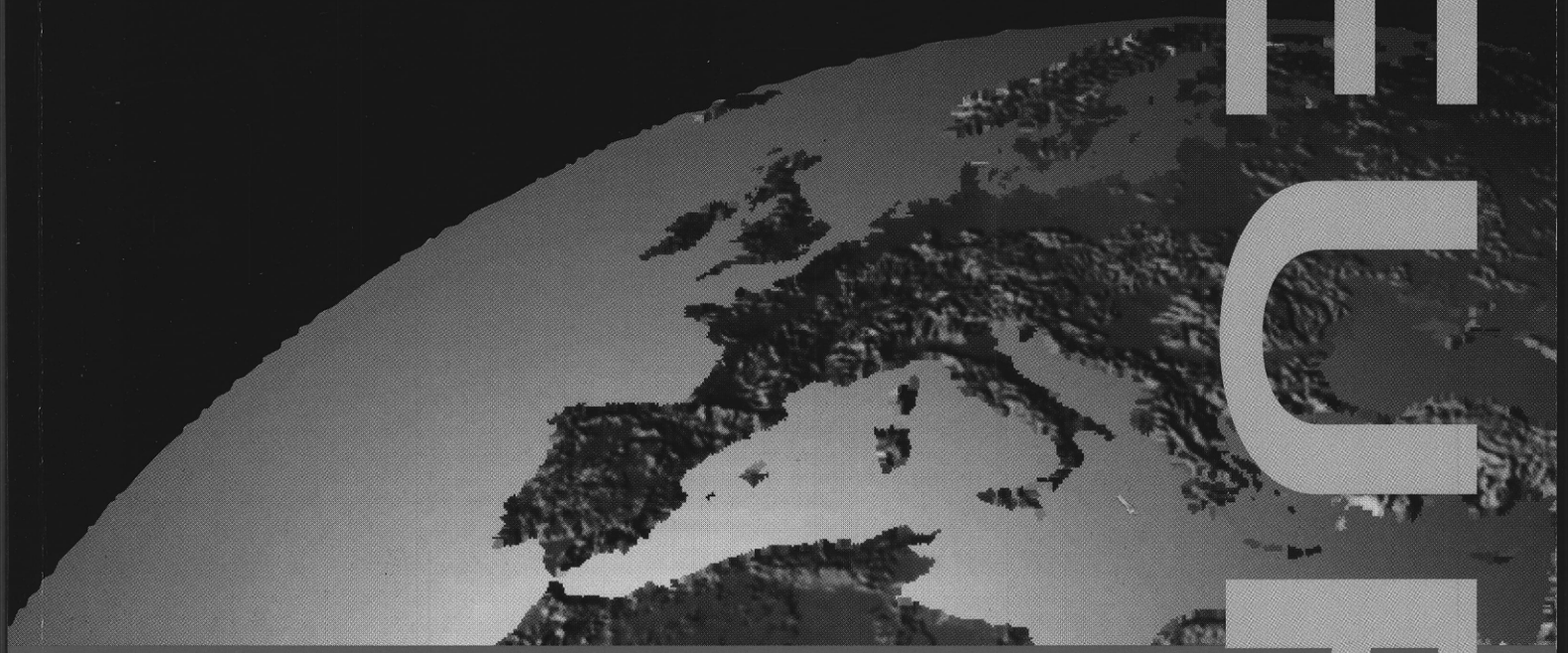
The Single Market Review



EUROPE

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Volume 1:

Food, drink and tobacco processing machinery

The Single Market Review

IMPACT ON MANUFACTURING

FOOD, DRINK AND TOBACCO PROCESSING MACHINERY

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EUROPEAN COMMISSION

The Single Market Review

IMPACT ON MANUFACTURING

FOOD, DRINK AND TOBACCO PROCESSING MACHINERY

The Single Market Review

SUBSERIES I: VOLUME 1

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This report is part of a series of 39 studies commissioned from independent consultants in the context of a major review of the single market. The 1996 Single Market Review responds to a 1992 Council of Ministers Resolution calling on the European Commission to present an overall analysis of the effectiveness of measures taken in creating the single market. This review, which assesses the progress made in implementing the Single Market Programme, was coordinated by the Directorate-General 'Internal Market and Financial Services' (DG XV) and the Directorate-General 'Economic and Financial Affairs' (DG II) of the European Commission.

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It does not, however, express the Commission's official views. While every reasonable effort has been made to provide accurate information with regard to the subject matter covered, the consultants are not responsible for any remaining errors. All recommendations have been made by the consultants for the purpose of discussion. Neither the Commission nor the consultants accept liability for the consequences of actions taken on the basis of the information contained herein.

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List of abbreviations

ASME	American Society of Mechanical Engineers
BLEU	Belgo-Luxembourg Economic Union
BSI	British Standards Institute
CAD	Computer-aided design
CAM	Computer-aided manufacturing
CEN	European Committee for Standardization
CENELEC	European Committee for Electrotechnical Standardization
CIP	Clean in place
CODAP	Code de construction des appareils à pression (pressure equipment construction code)
EFTA	European Free Trade Association
Eurostat	Statistical Office of the European Communities
ISO	International Organization for Standardization
NACE	General industrial classification of economic activities within the European Communities
NIC	Newly industrialized country
PPMA	Processing and Packaging Machinery Association
SAD	Single administrative document
UNIDO	United Nations Industrial Development Organization
VAT	Value added tax
WIPO	World Intellectual Property Organization

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1. Summary

1.1. Introduction

This study assesses the impact of the single market programme on the food, drink and tobacco processing machinery industry. It covers the 12 Member States and, unless indicated otherwise, 'EU' will refer to these 12 Member States.

In June 1985, the Commission of the European Communities published a White Paper entitled *Completing the internal market*.[1] It spelled out a list of measures and a timetable for removing all remaining administrative, physical and regulatory barriers, which had hindered cross-border trade and other transactions and prevented the creation of a genuine integrated market. The programme set out by the White Paper was started soon afterwards and became known as the '1992', 'single market' or 'internal market' programme.

More than 90% of the measures included in the 1985 White Paper have now been adopted and implemented by the Member States. The objective of this study is to analyse the impact of these measures on the food, drink and tobacco processing machinery industry. This analysis covers two main dimensions that, together, permit an overall assessment to be made:

(a) of how effective EU measures have been in removing administrative, physical and regulatory barriers to the creation of the single market;
(b) of the impact of EU measures on the industry's performance and strategies and of the market integration achieved by them.

There are two main sets of measures in the single market programme that are of relevance to the sector:

(a) vertical measures, related to the removal of regulatory barriers to intra-EU trade in food, drink and tobacco processing machinery, most of which have only come into force recently;
(b) horizontal measures, related to the removal of general barriers to trade and other cross-border transactions.

In addition, vertical measures in the food and allied industries gave rise to an increase of concentration in this sector and a change in the level and nature of demand for food, drink and tobacco processing machinery.

The analysis of the impact of the single market programme on this sector that is presented here is based on an analysis of quantitative data as well as on a number of interviews and surveys of equipment manufacturers and industry experts. In focusing on the observed changes in the regulatory environment and in the sector's performance, the results emphasize the changes in activity levels and trade that result from movements downstream from equipment manufacturers, and the short-term costs and benefits of compliance with the new regulations. Given the ongoing changes in the regulatory environment and the recent

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[1] *Completing the internal market*, COM(85) 310 final of 14 June 1985.

implementation of key measures, there are not sufficient elements to quantify the longer term costs and benefits, nor their expected impact on the sector's performance at world level. Indications of the nature and relative magnitude of these impacts are nevertheless provided, but will have to be confirmed when the industry has had more experience with the new regulatory environment.

1.2. Description of the sector

The food, drink and tobacco processing machinery industry is a very heterogeneous sector, manufacturing thousands of different products for varied clients in the food, drink and tobacco industries. Examples include equipment for the bakery, dairy, beverage, meat and poultry, seafood, fruit and vegetables, and confectionery sectors, as well as more specialist equipment for, among others, the manufacture of pasta, vegetable oil, ice-cream and cigarettes.

The industry employs about 100,000 people in the EU. With a production of ECU 9 billion, it accounts for approximately 5% of the mechanical engineering sector. The production of food, drink and tobacco processing machinery is a European speciality. While the available statistical data do not allow an exact comparison, the EU is undoubtedly the world's largest manufacturer, with a production at least three times as large as that of the United States, which comes in second position. The competitive strength of the EU in this sector is reflected by its trade performance, with some 30% of EU production, amounting to a value of 2.8 billion ECU, being exported to the rest of the world. Exports are almost seven times larger than imports, implying that the sector is a large contributor to the EU's trade balance.

Imports account for about 30% of domestic sales of food, drink and tobacco processing machinery. Import intensity is lower than in mechanical engineering as a whole and lower than the average for manufacturing industries. The share of intra-EU imports in total imports is, however, very high. About 80% of the imports of food, drink and tobacco processing machinery by Member States originates in other EU countries.

The structure of the EU food, drink and tobacco processing machinery industry is characterized by a very strong presence of small- and medium-sized enterprises. Firms with fewer than 100 employees account for 35 to 50% of sectoral employment and value added. Very small companies (those with fewer than 20 employees) mainly serve markets with many small customers (such as bakery equipment for small bakeries or dairy equipment).

1.3. Barriers to cross-border transactions before the single market programme

Technical barriers to trade were relatively low in the food, drink and tobacco processing machinery industry. Most of the equipment manufactured by the industry is not particularly hazardous and was therefore not subject to any specific national regulations. Only in a few segments were there significant obstacles to cross-border sales.

One can distinguish two origins of technical barriers: differences in technical regulations and differences in national industry standards. These, in turn, may each have two types of effects in terms of increasing the cost of cross-border sales. First, alterations to the equipment may be required in order that it may comply with legal provisions or industry standards in another Member State. Second, testing or certification of the equipment may be required to demonstrate compliance.

Where technical barriers to trade in the food, drink and tobacco processing machinery industry occurred, they mainly derived from differences in industry standards, and only seldom from differences in legal regulations alone. However, the distinction between these two types of barriers was not always clear-cut. The mechanism by which industry standards created barriers to cross-border trade was intrinsically connected with the practical implementation of legal regulations. The costs incurred as a result of these technical barriers therefore were more often due to the need for repeated conformity assessment procedures and less to the need for making modifications to equipment.

No Member State has issued regulations aimed specifically at food, drink and tobacco processing machinery or segments thereof. There were, however, in all Member States legal provisions regulating machine safety, which applied to all machinery, including equipment for food, drink and tobacco processing. These provisions were generally part of the legislation covering the area of worker safety, which deals with all issues relating to the protection of workers at work and the safety and hygiene of the workplace. They were primarily addressed to the user of equipment, but, in some cases, also to the manufacturer. This body of national legislation is still in place, but has been modified to incorporate the provisions of the Machinery Directive as well as other relevant EU directives.

As national provisions regarding machine safety were incorporated in worker and workplace safety legislation, they were primarily directed at users of equipment. In most cases no tests or certification were required from the manufacturer prior to placing the equipment on the market. Instead, that the machine safety rules were being observed was verified by regular inspections on the premises after the equipment had been installed. These inspections did not cover only machine safety, but all aspects of workplace and worker safety. In certain specific cases, however, the manufacturer was legally obliged to submit the product for inspection or provide other proof or declaration of conformity before it could be placed on the market. In other cases, such premarket control was strongly encouraged or, in fact, obligatory.

Machine safety legislation by itself did not create a barrier to cross-border sales in any Member State. The principal reason for this is that the legislation was expressed in very general terms, only laying down the broad safety objectives with which machinery had to comply before it could be put on the market or into service. The provisions were so general, and also similar across countries, that they did not oblige manufacturers to alter their equipment for commercialization in another Member State. Any manufacturers constructing their equipment according to good engineering practice could reasonably argue that they met the safety objectives laid down by the law.

Problems arose in proving conformity with legal requirements to customers, who naturally desired to purchase equipment complying with the local machine safety legislation. Here, national industry standards could, in fact, become binding. As explained above, machine safety regulations usually did not prescribe detailed technical specifications, but, rather, set out general objectives that had to be met by the product. To assist manufacturers in the interpretation of the general law, regulatory authorities issued technical guidelines demonstrating by which practical means the legal requirements could be satisfied. These technical guidelines made references to relevant national industry standards, which thereby received a presumption of conformity. Although the guidelines were not part of the law and thus not legally binding, they provided manufacturers and users with a convenient means of complying with the law. Furthermore, they significantly facilitated proving conformity to the

regulatory authorities, as simply referring to the standards applied sufficed and no detailed proof needed to be supplied. As a result, the national standards cited by such guidelines assumed a quasi-legal status. As a result, customers demanded equipment that was built to national industry standards and certified as such to ensure compliance with safety regulations, even though the law, of itself, did not impose particular standards, nor did it require certification of products. The same situation arose when customers insisted that equipment meet local standards because this was required by their insurance policies if they were to cover them for damage and liability risks. Frequently insurance companies will only insure machinery that is certified as meeting national industry standards.

Nevertheless, the barriers caused by the quasi-legal status of industry standards seem to have been limited to a few types of equipment or components that pose significant safety risks and are therefore under closer scrutiny from regulatory authorities and insurance companies. Cited were protective guards, electrical parts and heating systems.

A few types of equipment manufactured by the food, drink and tobacco processing machinery industry were subject to extensive specific national regulations, given the greater hazards they present. The most important case is pressure equipment, which is still governed by national rules. A proposal by the Commission for a pressure equipment directive is still under discussion by the Council and the Parliament. Pressure equipment was cited most frequently in the postal survey and interviews with those in the industry as encountering obstacles to cross-border sales. Pressure equipment has widespread applications in food, drink and tobacco processing machinery (for example, boilers, cooling coils, sterilization equipment, steam-heated equipment). Systems using pressure account for some 10% of the output of the sector.

Because of the large number of parameters, a detailed comparison of the rules on pressure equipment of different countries is impossible. Nevertheless, a broad overview suggests that, as with general machine safety regulations, the legislation of itself often does not create barriers to trade. The main hindrance to cross-border sales stemmed, as we have seen, from quasi-legal national industry standards, which force foreign suppliers to obtain national certification of their products and, in some cases, make alterations to the equipment.

1.4. Single market measures

The most important measure concerning the harmonization of technical regulations for machinery, including food, drink and tobacco processing machinery, has been the Machinery Directive adopted in 1989. The measure came into force in 1992. Its provisions became fully effective from 1 January 1995, when the transition period expired.

The Machinery Directive lays down common health and safety requirements with which machinery must comply before it can be placed on the EU market. These essential requirements are underpinned by harmonized standards that provide presumption of conformity with the provisions of the Directive. The Directive also establishes a common system of conformity assessment.

As a result, manufacturers are legally entitled to place the same model of machinery on the market of every Member State, providing it meets the essential requirements and providing that they have fulfilled the relevant conformity assessment procedure. Because the Directive defines common safety requirements at EU level, Member States are not entitled to impose additional national requirements, which would necessitate modifications to the product.

Equally, they are not entitled to demand that national conformity assessment be performed before the product can be placed on the market on their territory.

The Directive provides for the use of harmonized standards, which are technical specifications developed by European standardization bodies – the CEN (European Committee for Standardization) or CENELEC (European Committee for Electrotechnical Standardization) – on a mandate from the Commission. Machinery built according to a harmonized standard is presumed to comply with the essential safety requirements covered by that standard. Harmonized standards therefore provide a 'fast-track' option for complying with the compulsory essential requirements. The harmonized standards themselves are not, however, compulsory. Even where a harmonized standard exists, the manufacturer is free to choose other means of satisfying the essential requirements.

It was mentioned above that national machine safety legislation of itself did not create significant barriers to trade for most types of food, drink and tobacco processing machinery. As regards legal barriers to trade in food, drink and tobacco processing machinery, the impact on single market integration was thus mainly preventive. In other words, common Community-wide rules were defined governing the placing on the market of such machinery, thereby avoiding the risk that national measures would erect barriers to trade.

As well as preventing new national regulations from erecting barriers to trade in food, drink and tobacco processing machinery, the Directive may be instrumental in removing other types of trade barriers. The CE mark and EC declaration of conformity that must accompany every machine may reduce demands from buyers of equipment for conformity and certification to national standards as a form of proof that the product meets legal safety requirements. Such a change in customer attitudes would reduce the need for costly modifications to be made in line with demands from purchasers that machinery comply with non-mandatory national standards. It would also reduce the need to obtain approval from national testing and certification institutes in every country where the product will be sold, which is costly.

The Machinery Directive belongs to the new approach to technical harmonization. This approach was set out in a Council Resolution of 7 May 1985 on a new approach to technical harmonization and standards, and provided for more effective means of removing technical barriers to intra-EU trade. The new approach is built on four principles.

(a) Harmonization directives only lay down the essential requirements with which products on the market must conform. These requirements are expressed in general terms. They spell out the objectives that must be met by a product, but do not impose particular technical solutions or norms. The latter caused many 'old approach' harmonization attempts to become bogged down.
(b) The manufacturer or importer demonstrates compliance by issuing an EC declaration of conformity and affixing the CE mark to the product.
(c) Products complying with the directive enjoy free movement throughout the EU.
(d) Products built according to harmonized standards are presumed to comply with the essential requirements.

So far, the new approach has been applied to harmonize the regulation of about a dozen products or areas. In addition to the Machinery Directive, other directives apply to specific

types of industrial equipment, but they are less relevant to food, drink and tobacco processing machinery.

With the exception of simple pressure vessels – welded vessels manufactured in series to contain air or nitrogen and not intended to be fired –, pressure equipment is not covered by EU legislation. This is the area where most obstacles to cross-border trade were reported in the postal survey and interviews with those in the industry. A directive framed along the lines of the new approach and harmonizing safety requirements for pressure equipment is being drafted.

1.5. Impact of the single market on sectoral performance

The impact of single market measures and the market integration brought about by them occurs in two steps:

(a) direct short-term impact on market access and cost;
(b) induced effects resulting from the direct short-term changes in market access and cost.

The removal of physical, administrative and regulatory barriers to cross-border transactions achieved by single market measures has a direct impact on market access and production costs. The changes in market access and production costs offer enterprises in the food, drink and tobacco processing machinery industry new opportunities. Their exploitation results in induced effects in numerous dimensions of industry behaviour and performance: cross-border trade, increase in scale, foreign direct investment, sourcing, level of competition, productivity, employment and prices.

Up to the present day, the visible impact of the single market programme has been largely limited to direct short-term effects. Most of the important measures have only recently come into force. Physical border controls and custom formalities for intra-EU trade were removed from 1 January 1993. The Machinery Directive has been fully effective only since 1 January 1995, when its transition period ended. The assessment of the impact of these measures is rendered difficult by the fact that reliable statistical information mostly ends in 1992, before relevant measures were fully implemented. This is notably the case with trade statistics, which show a break in 1993. This might be related to the introduction of the INTRASTAT data collection system, which replaced the abolished custom declarations for the reporting of intra-EU trade transactions.

1.5.1. The direct impacts on market access and costs

Barriers to cross-border trade were already relatively low in most segments of the food, drink and tobacco processing machinery industry, and trade was substantial (though lower than the average in mechanical engineering). This suggests that the removal of internal barriers should not have significantly changed market access. It should have made it possible to achieve reduction in production costs, as some of the cost-increasing factors were removed.

The cost impact of regulatory harmonization can be grouped in four categories:

(a) initial adjustment costs;
(b) changes in the level of regulatory requirements compared to previous national regulation having an effect on costs;

(c) cost savings stemming from harmonization of regulatory requirements (to be distinguished from the effects of changes in the level);
(d) changes in the cost of conformity assessment.

In the top panel of Table 1.1 (reproduced from Table 4.3 in the report) below, rough indications of the various (potential) changes in costs are presented. The calculations are based on partial statistical information and cost estimates obtained from a small sample of firms. More details are supplied in the main body of the report under point 4.2. It should be noted that apart from the cost of adjustment and conformity assessment, the cost change estimates mainly relate to the expected impact, not to actual, experienced effects. Equipment manufacturers and end-users require time to discern and exploit the cost-saving opportunities presented by the new regulatory regime. So far, very few manufacturers have modified their equipment range in response to regulatory harmonization, so even the immediate effects have not yet completely materialized.

Table 1.1. The impact of the single market programme on costs in the food, drink, and tobacco processing machinery industry: industry totals

	Value of industry-wide cost changes (million ECU)	As percentage of value of industry production in 1993
Regulatory harmonization (sector-specific measures)		
Adjustment to new regulations (one-time cost)	40	0.5
Changes in the level of regulatory requirements	- 85	- 1.0
Harmonization of regulatory requirements	- 20	- 0.2
Changes in conformity assessment procedure	0	0
Total regulatory harmonization (except one-time costs)	*- 105*	*- 1.2*
Horizontal measures		
Elimination of customs formalities and border controls: direct impact[1]	- 25	- 0.3
Elimination of customs formalities and border controls: indirect impact[2]	- 20	- 0.2
Deregulation	- 90	- 1.0
Total horizontal measures	*- 135*	*- 1.5*

[1] Reduction of the delivery costs of food, drink and tobacco processing equipment exported to another Member State.
[2] Impact on the food, drink and tobacco processing machinery industry from the economy-wide reduction of production costs resulting from the reduction of the cost of imported inputs.
Source: Table 4.3 in text. Details on the calculations are provided under point 4.2.

The largest potential impact on costs derives from changes in the level of regulation. Notably, EU requirements may lead to it costing less for equipment destined for the German market to comply with regulations, as long as they are accepted by customers and inspection authorities. The potential savings resulting from harmonization are comparatively smaller. Companies do not see that there is much scope for standardizing machinery, given the strong end-user demand for customized solutions. Similarly, no savings are expected in conformity

assessment. Under previously applicable national rules, no certification was required for most types of equipment prior to commercialization. Summarizing, the potential cost savings of sector-specific measures can be estimated to be slightly more than 1% of the value of production.

The bottom panel of Table 1.1 presents an indication of the cost savings generated by horizontal barrier-removing measures. Two sets of information were used to derive the results. Hypotheses on the general cost implications of these measures were obtained from older studies. Their specific impact on the food, drink and tobacco processing machinery industry was assessed by means of an input-output model of the main European economies. The model is needed to take into account the intermediate supply relations between sectors. Horizontal measures affect all sectors in the economy, and the food, drink and tobacco processing machinery industry benefits from price reductions in the other branches.

Three types of effects from horizontal measures can be distinguished:

(a) a reduction in the costs of exporting food, drink and tobacco processing machinery that stem from the elimination of customs formalities and border controls;
(b) a reduction in the costs of intermediate inputs of the food, drink and tobacco processing machinery industry that stem from the economy-wide decrease in goods prices following the elimination of customs formalities and border controls;
(c) a reduction in the costs of intermediate inputs of the food, drink and tobacco processing machinery industry that stem from the economy-wide decrease in goods prices following the deregulation of certain sectors (mainly services).

The total cost reduction achieved by horizontal measures is estimated to be 1.5% of the value of production in the food, drink and tobacco processing machinery industry.

1.5.2. Induced effects

Examining various aspects of sectoral development, no clear induced effects of the single market can be detected. As mentioned earlier, the absence of a statistically visible impact is not too surprising. Most relevant measures have only became fully effective very recently, and after the period covered by reliable statistical information. Furthermore, as barriers in the industry were already relatively low in many segments, and even the direct short-term impact has not yet fully materialized, no substantial induced effects were expected.

The share of intra-EU imports in the total imports of food, drink and tobacco processing machinery is stable over the period 1980–92, at a very high 75–80%, and drops suddenly in 1993–94. The latter goes against the expected effect of single market integration, but is probably due to unreliable observations.

The share of intra-EU exports in total exports was around 30% until 1985, rose from 30% to 40% between 1985 and 1988, and remained at that level thereafter. However, the rise in the share of intra-EU trade was not due to an increase in intra-EU exports, but to a decrease in extra-EU exports. In the years following 1985, the US dollar depreciated by a third, deteriorating the international competitiveness of EU manufacturers of food, drink and tobacco processing machinery. This was significant as dollar-zone markets represent a

substantial share of extra-EU exports, and US producers are the main competitors of EU producers.

1.6. Business strategies

The single market programme has not brought major changes in the competitive environment of food, drink and tobacco processing machinery producers. As a result, so far, the main response to the single market programme has been short term and aimed at complying with the new regulatory requirements introduced by EU directives.

In the last decade, the dominant strategy of the leading suppliers in the food, drink and tobacco processing machinery industry has been one of horizontal integration. They have extended the scope of their activities to other types of equipment and also to other geographical markets. This strategy has been pursued by means of the acquisition of successful medium-sized companies that have highly regarded technology and trade marks, as these complement the technological capabilities and market access of the acquiring company. The large equipment producers have obtained their present shape and size largely through external growth.

Several motivations underlie the strategy of horizontal integration. One is the response to the changing nature of demand. In the late 1980s and early 1990s the food, drink and tobacco processing industries, like many other manufacturing and service sectors, undertook a wave of mergers and acquisitions. In the process, many small- and medium-sized food processing firms were taken over by global and pan-European concerns. As a result, machinery manufacturers now face fewer and larger customers with more varied demands. By extending their geographical and product scope, equipment suppliers have built up the capability to offer large customers a 'one-stop shop', where they can buy a wide range of equipment or complete integrated systems.

Another motivation is the realization that economies of scale can be made in marketing and R&D. Acquisitions offer the potential to improve the efficiency of sales and servicing networks by extending the product range of the company or by rationalizing the distribution organization of the combined enterprise. Ironically, the mature technology in food, drink and tobacco processing with little scope for innovation confers an advantage on large firms in terms of research and technology. Only large groups can mobilize the necessary resources to develop equipment to an appreciable degree by, for instance, setting up experimental facilities for the development of new processing techniques.

The last few years have seen the first steps being taken towards an integration of production operations in order to realize economies of scale in that dimension, too. At least one company is reorganizing its operations to centralize the production of standardized components in order to pursue increased volume and economies of scale. While clearly an international integration of production facilities is only possible when trade barriers are sufficiently low to allow this to happen, it should be noted that the rationalization was not an explicit response to the single market, nor was it limited to Europe, but, rather, was implemented on a global scale.

2. Introduction

2.1. The purpose of this study

This study assesses the impact of the single market programme on the food, drink and tobacco processing machinery industry.

In June 1985, the Commission of the European Communities published a White Paper entitled *Completing the internal market*.[2] It spelled out a list of measures and a timetable for removing all remaining administrative, physical and regulatory barriers, which had hindered cross-border trade and other transactions and prevented the creation of a genuine integrated market. The programme set out by the White Paper was started soon afterwards and became known as the '1992', 'single market' or 'internal market' programme.

More than 90% of the measures included in the 1985 White Paper have now been adopted and implemented by the Member States. The objective of this study is to analyse the impact of these measures on the food, drink and tobacco processing machinery industry. This analysis covers two main dimensions, which together permit an overall assessment to be made:

(a) of how effective EU measures have been in removing administrative, physical and regulatory barriers to the creation of the single market;
(b) of the impact of EU measures on the industry's performance and strategies and of the market integration achieved by them.

2.2. The relevance of the industry to the single market

The food, drink, and tobacco processing industry is part of the mechanical engineering sector, one of the EU's largest industrial sectors and its largest exporter. In its role as supplier of production equipment, mechanical engineering has a crucial influence on the productivity and competitiveness of the other branches in the economy. While the mechanical engineering sector is very heterogeneous, many of its segments are characterized by a fairly uniform production technology. The production process is labour-intensive and difficult to automate, partly due to a very differentiated output. The manufacture of food, drink and tobacco processing machinery can be regarded as representative of other segments of the mechanical engineering sector that produce special-purpose machinery which is not particularly dangerous.

Machinery is subject to national regulations aimed at the protection of workers' health and safety. Differing product regulations and national standards in the individual Member States were identified in the 1985 White Paper as being one of the main obstacles to the creation of an integrated single market.

2.3. A description of the industry

As is clear from its name, the food, drink and tobacco processing machinery industry makes equipment for the industrial processing and preparation of food products, beverages and

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2 *Completing the internal market*, COM(85) 310 final of 14 June 1985.

tobacco. One of the most striking characteristics of the industry is the very wide range of equipment it manufactures. This diversity reflects the large variety of processes carried out in its client sector. Indeed, the NACE Rev1 classification of economic activities distinguishes 34 segments in the food, drink and tobacco industry, including, among others, the production and processing of meat, fish, fruit and vegetables, animal and vegetable oils and fats, dairy products, bread, biscuits and pastry, chocolate and coffee. Each of these segments has distinct processing technology that requires correspondingly distinct equipment. Furthermore, in each of these segments, production of the items involves a series of distinct processing steps, ranging from the preparation of raw materials and various types of processing to the finishing of the end product, each of the steps requiring appropriate specialized equipment. To provide some illustration of the wide diversity of food, drink and tobacco processing machinery, the box below lists a sample of equipment types, grouped by processing stage. It should be noted that the list gives only a limited impression of the variety of food equipment as, especially in the later processing stages, the equipment is specialized by food product, further increasing the number of types.

In the NACE 1971 classification, the food, drink and tobacco processing machinery industry appears as part of group 324 of the NACE 1970 classification, 'Manufacture of machinery for the food, chemical and related industries'. In addition to the food, drink and tobacco processing machinery industry itself, this group includes the manufacture of equipment for the chemical industry, the manufacture of packaging machinery and the manufacture of machinery for the rubber and plastics industries. All these sectors are closely related, either in terms of technology or end-user markets or both, and companies often operate in several or all segments. The manufacture of food, drink and tobacco processing machinery represents about 40% of the production value generated by NACE 324.

Sample of types of food processing equipment

Raw material preparation	Washers, sieves, screens, sorters, graders, crushers, grinders, mashers, choppers, pitters, corers, slicers, squeezers, cutters, dicers, trimmers, derinders, skinners, eviscerators.
Ingredient handling	Soakers, steamers, dehydrators, homogenizers, strainers, coagulators, mixers (horizontal, vertical, rotatable, biplex, ...), blenders, cream separators, filters, kneaders.
Moulding	Dough rounders, pastry stampers, presses, moulders, demoulders, sheeters, depositors, cutters, extruders.
Thermal processing	Dryers, ovens (roasting, direct, convection, cyclotherm, radiant, hot plate, radio-frequency, infra-red, microwave), heat exchangers, evaporators, blanchers, boilers, cookers, pressure cookers, temperers, renderers, smokers.
Low-temperature processing	Refrigerators, coolers, chillers, freezers (tunnel, spiral belt, plate, air blast, cryogenic).
Finishing	Applicators (chocolate, sugar, cream, salt, batter, breading, tempura).

Source: Frost and Sullivan.

The link between the manufacture of equipment for the food, chemical and plastics industries is mainly technological. Process technologies (for example, separation, heat exchange, flow control) are often common to all or many processing industries. Manufacturers specializing in

such a technology generally do not restrict themselves to one end-user market, but supply equipment to clients in several sectors, including the food, chemicals and pharmaceuticals industries. The specifications for the equipment may differ greatly depending on their particular applications (for instance, hygiene is crucial in the food and pharmaceutical industries, but less so in plastics processing), but they share the same underlying technology.

The relationship between food processing and packaging machinery rests mainly on common end-user markets. The food, drink and tobacco industry is indeed the largest buyer of packaging equipment, followed by the pharmaceutical industry. Many food processing equipment producers have diversified into packaging machinery, or the opposite, so that they can offer their customers a comprehensive range of equipment, covering all steps in the production process, from the preparation of raw materials to packaging the finished product.

2.4. The economic significance and structure of the industry

2.4.1. Key indicators

The food, drink and tobacco processing machinery industry in the EU employs about 100,000 people. With a production value of ECU 9 billion, it accounts for approximately 5% of the EU mechanical engineering sector.

Germany is the most important producer of food, drink and tobacco processing equipment, representing nearly 40% of the total output of the EU. This figure reflects Germany's overall strength in mechanical engineering, where it also accounts for about 40% of EU production. The German food, drink and tobacco processing machinery industry is almost entirely located in what was formerly West Germany. Only about 2% of Germany's output originates in former East Germany. Italy is the second largest producer with a share of about 20% of the EU's output, also in line with its weight in overall engineering. Other countries that have significant outputs are France (16%), the Netherlands (9%) and the United Kingdom (7%). Denmark is a smaller but very export-orientated producer. Finally, a small presence can be identified in Spain and Belgium, while the sector is virtually absent in Ireland, Greece, Portugal and Luxembourg (see Table 2.1).

Table 2.1. Food, drink and tobacco processing machinery: key indicators (1993)

	Production (million ECU)	Employment (thousands)	Exports (million ECU)	Imports (million ECU)
EU	9 000	97	Extra-EU 2 791 Intra-EU 1 118	Extra-EU 426 Intra-EU 1 101
Germany	3 500	44	1 249	288
Italy	1 900	15	889	137
France	1 500	13	344	232
Netherlands	800	9	439	139
United Kingdom	600	7	422	272
Denmark	300	4	317	72
Spain	200	3	117	112
BLEU	100	1	104	130
Ireland, Greece, Portugal	100	1	28	145

Source: National statistics, Eurostat.

The Netherlands shows the strongest relative specialization in food, drink and tobacco processing equipment. Its share in the EU's total output of this equipment is three times higher than its overall share in mechanical engineering. In contrast, the UK shows the weakest specialization in food, drink and tobacco processing equipment, although it is home to the world's largest dedicated producer, APV. The UK's production of food, drink and tobacco processing equipment is only half of its overall mechanical engineering output.

2.4.2. Trade and competitiveness

The trade intensity of the food, drink and tobacco processing machinery industry is relatively low. Both its export intensity and its import penetration are significantly lower than the average for mechanical engineering (see Table 2.2). In comparison with the entire manufacturing sector, it has about the same export intensity, but a clearly lower import penetration. Those in the industry do not ascribe the relatively low trade intensity to regulatory barriers, but, rather, to the close and loyal supplier–client relationships that tie food processing firms to local suppliers, especially in the more traditional segments such as bakeries or meat processing.[3]

Another noteworthy aspect of the trade pattern in the food, drink and tobacco processing machinery industry is the intra-EU share in total trade. On the import side, the intra-EU share is very high, with almost 80% of imports originating from other EU Member States. On the export side, in contrast, the extra-EU-share is high. More than 60% of foreign sales is shipped to non-EU destinations. Both features also characterize the mechanical engineering sector as a whole, but to a much lesser degree (see Table 2.2). The pattern reflects the very strong competitiveness of the EU food, drink and tobacco processing machinery industry in world markets. Extra-EU exports exceed imports by a factor of seven, making the sector a large contributor to the EU's trade balance (it contributed almost ECU 2.4 billion in 1993, as shown in Table 2.1).

The production of food, drink and tobacco processing machinery is indeed a European speciality. While the available statistical data do not allow exact comparisons to be made, the EU is undoubtedly the world's largest manufacturer, accounting for approximately two thirds of the global output. It is followed, at a distance, by the United States, which contributes about one sixth.[4] Japan, however, has no significant presence in this sector.

The EU sells food, drink and tobacco processing machinery to a wide variety of non-EU countries. Recently, Eastern Europe has become the largest export destination, absorbing about a fifth of extra-EU exports (see Table 2.3). Another fifth finds an outlet in Asia. Traditional export destinations such as the Mediterranean and Africa have lost their former importance, but still each represents between 10 and 15% of extra-EU exports. Sales to North America rise and fall with the fluctuations in the value of the dollar. In 1992, North America accounted for 12% of EU exports of food, drink and tobacco processing equipment.

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3 *Source:* Interviews. One company mentioned it is easier to find customers in Asia, where there are no established producers and commercial networks, than in a neighbouring EU country.

4 Calculations based on UNIDO [1992] and US Industrial Outlook 1995.

Table 2.2. The trade intensity of food, drink and tobacco processing machinery industry and other selected sectors (1992)[1]

Sector	Import penetration (ratio of imports to domestic sales, %)				Export intensity (ratio of exports to production, %)			
	Intra-EU	Extra-EU	Total	*Share intra-EU*	Intra-EU	Extra-EU	Total	*Share intra-EU*
Food, drink and tobacco processing machinery	22	6	28	*78*	16	25	41	*38*
Machinery for the food, chemical and related industries (NACE 324)	30	12	42	*71*	24	31	55	*44*
Mechanical engineering	32	18	50	*65*	27	31	58	*47*
Manufacturing sector	24	14	38	*62*	23	15	38	*60*

[1] The year 1992 is chosen as a reference point, because the trade data from 1993 onwards seem less reliable. First, a large fraction of exports (up to 10%) is classified as having no determined destination. Second, the data register a sudden drop of intra-EU trade, which is difficult to explain by economic arguments. While an decrease of intra-EU trade could be expected owing to the continuing recession, the suddenness and sharpness of the cutback also suggests reporting problems or even permanent changes at the start of the INTRASTAT data collection system. The available data for 1994 show that the share of intra-EU trade did not reverse its downward jump of the year before, but remained at a lower level.

Source: Calculations based on data from Eurostat and national sources.

Table 2.3. Food, drink and tobacco processing machinery: the geographic structure of extra-EU trade (1992)

Region	Share of region in extra-EU:		
	Exports	Imports	Trade balance
EFTA and other Europe	12	60	1
new Member States	7	26	2
other	6	34	-1
Eastern Europe	20	3	24
Mediterranean	13	1	15
Africa/Gulf	11	1	13
North America	12	27	9
Latin America	11	1	13
Asia	19	6	21
Japan	3	5	3
NIC	6	1	7
China	4	0	5
other Asia	6	0	7
Oceania	2	1	3

Source: Calculations based on Eurostat data.

This is about the same as its share in 1980, but significantly less than it was in 1986 when the importance of North America as an export destination peaked at 20%. The US remains, however, the single largest buying country of EU food, drink and tobacco processing machinery. Sales to EFTA countries have been relatively stable, at 12–14% of extra-EU exports.

Imports by the EU of food, drink and tobacco processing equipment are concentrated in two regions. By far the most important are nearby European countries – particularly Switzerland, Austria and Sweden – which covered 60% of extra-EU-12 imports in 1992. The second largest supplier is the United States, representing about 30%.

The EU runs a trade surplus in food, drink and tobacco processing equipment against all countries except Switzerland. Eastern Europe and Asia are the most important sources of the surplus, followed by the Mediterranean and Africa. Trade with these regions is almost one-sided. EU exports are not matched by any significant EU imports from these regions.

2.4.3. The structure of the industry

Concentration

The most striking characteristic of the food, drink and tobacco processing industry is the high degree of product differentiation. This differentiation stems from the variety of end-user segments and the diversity of functions that are performed in the processing and preparation of food, drink and tobacco products. To meet the needs of the food, beverage and tobacco industries, the equipment manufacturers must supply an extremely wide range of machine types (illustrated by the list of types of equipment presented earlier). In addition, equipment is mostly customized to the specifications of the individual customer, further increasing the degree of differentiation.

The highly differentiated products offered are reflected in the structure of the industry, notably in the very strong presence of small- and medium-sized enterprises. Firms with fewer than 100 employees account for 35 to 50% of employment in this sector and value added while enterprises with more than 500 employees represent less than 10%.[5]

The main difference between large and small firms is the scope of their activities. Small firms follow a focus strategy. They specialize in one or a few end-user segments (for instance, bakeries or fruit and vegetable processing) and applications (such as ingredient handling or baking). Most also operate within a small geographical area. In contrast, the large firms are active in a large number of market segments along all three dimensions of segmentation – geographical regions, end-user industries and applications. For instance, a large enterprise may manufacture equipment in a range of processing and thermal technologies and sell this equipment to customers in over a hundred countries in a variety of sectors, including the food,

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[5] Estimates based on partial information from Eurostat and national sources. It should be noted, however, that for statistical purposes a firm is defined as a separate legal entity. Industry concentration arising from group structures, where all or some subsidiaries maintain an independent incorporated status, will therefore not be captured by official statistics. This explains why the estimate given below of the market share of the six largest groups in Europe of 20% exceeds the estimated share for enterprises with more than 500 employees of 10%.

beverage and tobacco industries, but also pharmaceuticals, chemicals, rubber and plastics, paper, energy, waste water treatment and industrial heating.[6]

Leading companies

The largest firms selling food, drink and tobacco processing equipment in the EU are APV (UK), Tetra-Laval (Sweden), GEA (Germany), Sasib (Italy), Stork (Netherlands) and Buhler (Switzerland). Only two of them, APV and Sasib, make predominantly food, drink and tobacco processing equipment. GEA, Stork and Buhler are large engineering concerns and food and process technologies are just one of their businesses. Tetra-Laval's largest division is packaging machinery and materials. One common development strategy can be discerned from the histories of these companies. With one exception, they have largely expanded their food, drink and tobacco processing business through external growth, that is, acquisitions.

APV is the world's largest manufacturer of food processing equipment and also has the most comprehensive product lines. The company was founded at the beginning of the century, but its present form owes much to a series of acquisitions that it made in the second half of the 1980s, which enabled APV to extend both its product and geographical scope. The most important were Baker Perkins (UK, dry food equipment), Pasilac (Denmark, dairy equipment), Rosista (Germany, brewery equipment) and Ortmann and Herbst (Germany, bottle- and can-filling machines).

Tetra-Laval is the result of a merger between the two Swedish companies Tetra Pak and Alfa Laval in 1993. This merger followed more than 20 acquisitions in the food and industrial equipment sector made by Alfa Laval in the second half of the 1980s. Major purchases were Koppens Machinefabriek (Netherlands, convenience foods), Formax (US, convenience foods) and Kramer and Grebe (Germany, meat processing and sausage making). The group employs about 36,000 people world-wide in 4 divisions: Tetra Pak, Tetra Laval Food, Alfa Laval and Alfa Laval Agri. Tetra Pak is the largest division, with about 17,000 employees. It is known world-wide for its carton packaging for dairy and other drinks, and supplies both machinery and packaging materials, as well as various types of food processing equipment. Tetra Laval Food has about 2,500 employees and offers various specialized processing and packaging equipment for convenience foods, ice-cream, fats and oils and viscous foods. Alfa Laval, employing 13,000 people, makes all kinds of equipment for industrial processes, such as heat exchangers, centrifugal separation units, fluid transport equipment and computer-based process control systems. Customers include the food, chemicals, pharmaceuticals and energy sectors. Finally, Alfa Laval Agri is the world's leading supplier of equipment to dairy farms.

GEA is a very large engineering company in the fields of energy, air treatment and process technologies, employing some 18,000 people in 150 companies world-wide. By means of a series of acquisitions, the company has almost quintupled sales in the last ten years. Major acquisitions in food and process technologies have been Grasso (Netherlands, refrigeration), NIRO (Denmark, industrial drying equipment), Westfalia Separator (Germany, centrifuge separators and milking machines) and Tuchenhagen (Germany, liquid processing equipment). The food industry accounts for about a fifth of GEA's sales.

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6 Frost and Sullivan [1994], interviews.

Sasib is also a rapidly expanding group, having doubled its sales in the last five years. Originally a producer of fixed railway equipment and tobacco processing equipment, the company has diversified since the mid 1980s into food processing and packaging machinery, which now represents more than half of its sales. This diversification was entirely accomplished by a large number of acquisitions, including Manzini Comaco (Italy, fruit and vegetable processing), Simonazzi and Sarcmi (Italy, bottling and filling), Meincke (Denmark, bakery equipment), Spooner Vicars (UK, bakery equipment) and the wrapper business unit of FMC (US). Sasib has about 4,500 employees world-wide.

The Stork Group is a major Dutch engineering company supplying a wide range of capital equipment and also consumables for the printing, coating and food industries. The group employs 17,000 people in about 85 operating companies. The units manufacturing equipment for the food and beverage industries employ about 1,500 people. Stork is one of the largest producers of slaughtering and meat processing systems, and is the world market leader in poultry processing equipment. The group also provides packaging systems and equipment for the dairy and beverages industries.

Buhler is a Swiss engineering group, but its food equipment division is based in Germany. In contrast with the companies mentioned above, Buhler has grown internally, without major acquisitions. It makes very diverse products. Deriving most of its revenues from flour milling and cocoa processing equipment, it also produces machinery for several special segments, such as those used to make pasta, breakfast cereals, baby foods, dry soups and vegetable oil. The Buhler group has about 7,000 employees, of which about 1,500 are employed manufacturing food processing machinery.

Because of the wide geographical and product scope of the large firms in the food, drink and tobacco processing machinery industry – and especially the fact that this scope usually extends beyond the food, beverage and tobacco industries – the calculation of market shares and degree of concentration is difficult. The six leading companies described above probably account for at least 20% of food, drink and tobacco processing machinery sales in the EU. This is a minimum estimate, based on company reports, and excludes certain divisions with sales to a mix of industries in unknown proportions. The market for food processing equipment is, however, highly diversified, so that in individual segments the concentration may be much higher. For instance, only a few firms in Europe manufacture cigarette- or ice-cream-making machines.[7]

Entrants

The industry has not witnessed any new entrants to the market recently, and this eventuality is considered improbable in the future. The many niches in the market are occupied by existing companies, while the maturity of the technology offers no opportunities for entry by new players on the back of innovations as it might in other sectors.

Distribution and marketing

The great majority of companies in the food, drink and tobacco processing machinery industry rely on direct sales for the distribution of their products. The large groups maintain wholly-

[7] Company annual reports, Frost and Sullivan [1994], interviews.

owned world-wide sales and service networks with branches in over a hundred countries. These local branches take care of sales, installation, after-sales servicing and supplying spare parts. Increasingly, they also have engineering capabilities to design production lines or customize equipment to the specifications of local customers.

Small companies sell their products directly to the end-user or to an engineering company or other food processing machinery producer who will incorporate this equipment into a production line. Some companies use the services of independent sales agents. These are mostly engineering companies, which sell, install and service equipment from various manufacturers.

The predominance of direct sales derives from the end-users' demands for customized solutions, as well as for after-sales technical assistance. Meeting this demand necessitates direct and close contacts with the end-user. For the same reason, geographical expansion is generally pursued by cross-border acquisitions, as opposed to the use of distributors.[8]

The ability to fully meet customer needs is regarded as crucial to competitiveness. One company said that it had recently substantially altered its equipment line as a result of demands from large customers. Equipment manufacturers and end-users engage increasingly in co-design and co-development. For instance, APV, GEA and Tetra-Laval have established laboratories where researchers from the food industry, in collaboration with the staff of the equipment producer, can develop and try out new processing techniques.

2.4.4. Technology

Production

The manufacture of food, drink and tobacco processing equipment is very labour-intensive. It shares this characteristic with most other segments of mechanical engineering, especially that of special-purpose machinery. Indeed, manufacturing equipment and machinery involves much manual assembly and fitting of components, which cannot be easily automated. Pay makes up about 35% of production value and 85% of value added.[9]

The largest cost items are purchases of intermediate materials, components and services, which account for approximately 60% of production value. Materials and components make up some three quarters of intermediate inputs, or 45% of production value. The largest categories are steel and metal products, components from the mechanical engineering sector and electrical components. Purchases of services account for some 15% of production value. Various business services (accounting, consulting, data processing and so on) make up about half of that. The cost of transport and communication services each amount to less than 1% of production value.

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8 Frost and Sullivan [1994], interviews.

9 Estimates based on partial information on the food, drink and tobacco processing machinery industry from national sources and checked with Eurostat data on NACE group 324.

Research and development

The technology of food, drink and tobacco processing is mature, so no major technological breakthroughs are expected. Nevertheless, significant research and development effort is invested in the continuous, gradual improvement of equipment. R&D spending in this sector amounts to about 5% of sales. Important areas of technological improvement are the use of CAD/CAM (computer-aided design/computer-aided manufacturing), sterilization techniques and clean-in place (CIP) technology. CAD permits machinery manufacturers to customize their products to the needs of specific buyers at lower cost. Similarly, the integration of CAM capabilities (for instance, computerized control panels) increases the flexibility of the machinery. There is a strong demand from food producers for improved sterilization techniques as these allow them to lengthen the shelf-life of their products and reduce the risk of food poisoning. CIP technology responds to the same need to avoid contamination during the processing. CIP technology involves the development of machine designs and cleaning equipment that permit machines to be cleaned effectively without having to dismantle them.

In spite of the limited scope of technological progress, there are a considerable number of patents for food, drink and tobacco machinery. Due to the high degree of product differentiation, they offer little effective protection against competitors, who can easily develop and design equipment around patents. However, manufacturers value patents as an instrument for marketing because they testify to the engineering capabilities of a firm and to the quality of its products.

Economies of scale

Because of the broad product range of the food, drink and tobacco processing industry, estimating the degree of economies of scale is difficult. Pratten's (1988)[10] survey of economies of scale did not find any studies that have estimated this in the manufacture of food and related machinery. He argues, however, that the technology of the sector is very similar to that of specialized machine tools (NACE 322), which has been investigated. However, even for that industry the findings are not very precise. Minimum efficient firm scale is concluded to be the output of one factory, but without quantitative indication given. Unit costs are estimated to increase by 3–5% if output is halved, but, again, there is no indication as to what level this occurs on. Economies of scale are mainly related to the length of model runs and batch sizes, with savings being obtained by spreading the development and batch set-up costs over a larger number of units.

How important economies of scale derived from larger batch sizes can be is superbly illustrated by a paper by Geoff Mason of the UK's National Institute of Economic and Social Research (NIESR) and David Finegold of the RAND Corporation.[11] The authors report on a series of studies carried out at the NIESR that compared matched samples of US, UK and Dutch production plants in three selected branches of engineering, which were centrifugal liquid pumps, hydraulic valves and compression springs. The studies found a large

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[10] Pratten, C. 'A survey of the economies of scale', in European Commission, *Research on the 'Cost of non-Europe': Basic findings*, Vol. 2, *Studies on the economics of integration*, Chapter 2, Office for Official Publications of the European Communities, 1988.

[11] Mason, Geoff, and Finegold, David. *Productivity, machinery and skills in the United States and Western Europe: Precision engineering*, Discussion Paper No 89, National Institute of Economic and Social Research, December 1995.

productivity gap between plants in the US and their counterparts in Europe. The average output per hour in American plants was 25% higher than that in Dutch ones and even two thirds higher than that in British plants. Further investigation pointed to large economies of scale related to bigger batch sizes as being the main reason for the substantial US lead in labour productivity. Average US batch sizes were roughly 4.3 times those of British and 3.5 times Dutch batch sizes.

American plants derived two advantages from their bigger average batch sizes. The first and most obvious was lower set-up time per unit produced, as the fixed time of setting up machinery for a batch was spread over a larger number of units. Indeed, when setting-up operations for similar types of machinery were compared, these turned out to take about the same time in US and UK plants, and approximately a third less in Dutch plants. However, the slower set-up times in US plants were more than offset by the positive effects of larger batch sizes, so that the set-up time per unit was considerably lower in the US than in Europe.

A somewhat less obvious advantage was that the larger batch sizes created productivity advantages in the machining and assembly of products, such that US output per hour exceeded European levels by 30 to 100%. The higher labour productivity in the processing stage in US plants derived from higher machine to man ratios (roughly 2 machines per operator in the US compared to 1.5 in the UK and the Netherlands) and from the greater use of automated machinery. Both were found to be related to larger batch sizes.

Another important finding of Mason and Finegold is that in all three countries, the bulk (half to two thirds) of production consisted of standardized components made for stock, with the assembly of finished products being done to customer order. A significant fraction (a quarter to a third) of output was made entirely to customer order, while only a small part (5% in the UK and Netherlands and a quarter in the US) consisted of commodity products sold off the shelf. The main factor explaining the pattern of batch size differences is thus not the wider prevalence of commodity production in the US, but, rather, appears to be the fact that the clients of US plants ordered products in larger quantities and/or of fewer different specifications.

Returning to food, drink and tobacco processing machinery, those in the industry broadly agreed with the qualitative conclusions in Pratten. Economies of scale are related to the length of production and model runs and cease to exist if you look at the output of just one plant. It should be emphasized, though, that in the construction of special-purpose machinery, the exploitation of these economies of scale is constrained by the differentiation of demand, which is characterized by the existence of many small market segments. The importance of the uniformity of client demand in achieving economies of scale was also apparent in the NIESR studies described above.

Further economies of scale follow from threshold effects in research and development and in tendering for large contracts, which can only be undertaken by sufficiently large firms that are able to command the necessary organizational and financial resources. Large contracts, involving the construction of complete processing lines and plants, especially overseas, are thus the exclusive domain of the largest enterprises. Ironically, the mature technology in food, drink and tobacco processing, which offers little scope for innovation, confers an advantage on large firms when it comes to research and technology. Only large groups can mobilize the

necessary resources to develop equipment to an appreciable degree, for instance by setting up experimental facilities for the development of new processing techniques.

2.5. Methodology

The study of the impact of the single market on the food, drink and tobacco machinery industry is based on primary and secondary research.

The primary information for this report was obtained from:

(a) telephone interviews with officials of European and national trade associations;
(b) telephone interviews with technical or marketing personnel of equipment manufacturers;
(c) interviews with experts in the industry and legal experts of the European Commission;
(d) postal survey of equipment manufacturers, with telephone follow-up.

The sample of companies included in the survey is described in Appendix A, which also presents the questionnaire that was used.

The results of this primary research underlie the qualitative analysis of the barriers to cross-border transactions in the sector, the description of European legislative and administrative actions taken to eliminate those barriers and the analysis of the impact of the single market on the industry's performance and strategies.

The secondary information sources are:

(a) existing literature on the sector;
(b) European Commission documents (especially legislative documents);
(c) statistical data from national statistical offices;
(d) statistical data from national trade associations;
(e) statistical data from Eurostat.

Most of the quantitative analysis of the impact of the single market on the sector is based on these secondary sources of information.

The collection of comprehensive and consistent statistical data on the food, drink and tobacco processing machinery industry, however, raised numerous problems. At this level of detail, few statistics are available (see Appendix B, Note on data sources). With the exception of international trade data, no industry statistics consistent across countries and time can be presented. Consequently, much of the quantitative analysis was conducted at the level of NACE 1970 Group 324, which also includes the manufacture of packaging machinery and that for the chemical, pharmaceutical, plastics and rubber industries. For this broader sector definition, time series are available from Eurostat for the 12 Member States. These data are collected by Eurostat from the national statistical offices. They are based on the annual surveys of manufacturing and generally cover enterprises with 20 employees or more. However, even at this broader level there are changes in the sector definition over time for some countries, so the data have to be interpreted with caution.

As indicated above, the subgroups of NACE group 324 are closely related, and they are affected by single market integration in a very similar way.

2.6. The structure of the report

Chapter 3 of this report reviews the legislative and regulatory environment in place in the food, drink and tobacco processing machinery industry before the launch of the single market programme. It then describes the manner in which single market measures have changed this environment, in particular by removing barriers to cross-border transactions within the EU. The analysis of the expected and observed impact of the regulatory changes brought about by the single market programme on the costs, structure and performance of the industry is left to Chapter 4. In Chapter 5 the implications of the single market programme on the corporate environment are investigated, as well as the nature of the strategic responses. The Appendices contain further details on the survey, the sources of data, national machine safety legislation, the methodology and results and the case studies.

3. The legal and administrative measures taken to complete the single market

In this chapter, an analysis is made of the barriers to cross-border transactions in the food, drink, and tobacco processing machinery industry and of the measures taken by the EU to overcome these barriers. The objective is to analyse how the measures taken to complete the single market are intended to remove these barriers and to assess their practical implementation and functioning. The impact of this legislation on those in the food, drink and tobacco processing machinery industry (costs, benefits, changes in behaviour) fall outside the scope of this chapter and so they will be addressed in subsequent chapters.

The analysis of barriers to cross-border transactions and of single market measures taken to overcome them is presented in three parts. In 3.1., the measures aimed at removing technical trade barriers are covered. These barriers arise from differences between the Member States in the technical regulations that exist for the equipment manufactured by the food, drink and tobacco processing machinery industry. In 3.2., other barriers to cross-border transactions, created by national legislation and administrative practices, but not related to the regulation of the equipment itself, are discussed. In this section a number of horizontal measures taken to complete the single market are reviewed. They may affect all businesses but also have a distinct impact on the food, drink and tobacco processing machinery industry. Finally, under 3.3, the remaining obstacles to cross-border transactions or shortcomings in measures introduced by the EU to address them are identified.

3.1. The implementation of sector-specific measures

No measures adopted in the course of the single market programme apply specifically to food drink, and tobacco processing machinery. The industry is, however, directly affected by EU measures that seek to remove technical barriers to trade by harmonizing technical regulations and industry standards in the European Union. Those of relevance to food, drink and tobacco processing machinery will be covered in this section on sector-specific measures. First follows a preliminary discussion of the nature of technical trade barriers and their incidence in the food, drink and tobacco processing machinery industry.

3.1.1. A typology of technical trade barriers

Trade barriers are costs triggered by the crossing of a national frontier. They occur whenever the cost to manufacturers of selling their products in a foreign market is higher than the cost of selling the same product in the domestic market, other things (such as distance to customer) being equal. Apart from this single essential characteristic, trade barriers can assume a wide variety of forms.

Obviously, trade barriers create an obstacle to the establishment of an integrated single market. The additional costs incurred on export sales discourage firms from marketing their products in another Member State or make them less competitive in comparison with local rivals in that country.

Technical barriers constitute a particular type of trade barrier, arising as they do from differences in technical regulations and industry standards between countries. One can

distinguish two origins of technical barriers and two types of barriers caused by them (see Figure 3.1).

Differences between countries' legal technical regulations are the first source of technical trade barriers. Technical regulations are legal requirements laid down by national authorities in the interests of public health, safety and the environment and with which products must comply before they can be marketed or used. The second type of trade barrier is caused by differences between countries' industry standards. Standards set out specifications regarding the form, functioning, materials, quality, compatibility and so on of products. They are developed by private standardization bodies (like the DIN in Germany, AFNOR in France and BSI in the UK). In this sense they are like technical regulations, but they differ from them in that they are voluntary and not legally binding.

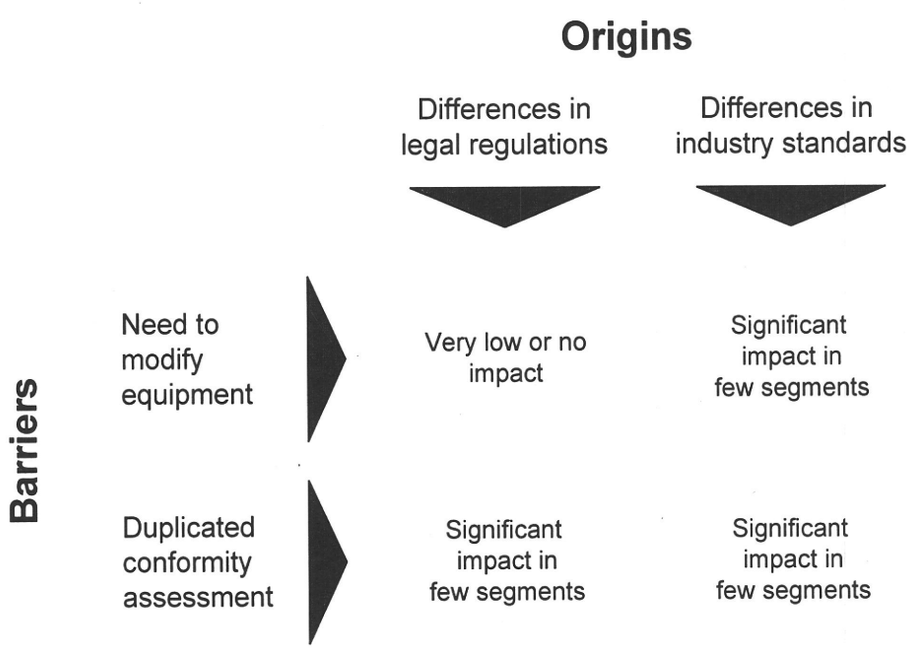
To see why differences in legal technical regulations and industry standards create trade barriers one must look at their consequences for manufacturers wishing to export their products. At first sight, legal technical regulations are non-discriminatory, at least within the EU. They are equally applicable to domestic and imported products and therefore do not seem to impose a heavier burden on goods sold across national frontiers than they do on domestically marketed products. Regulations specifically targeting imports of other Member States are explicitly prohibited by Article 30 of the EC Treaty, which bans 'quantitative restrictions on imports and all measures having equivalent effect'.

Nevertheless, even when regulations are non-discriminatory, the fact that they differ from country to country may impose additional costs on manufacturers selling their products across national frontiers, thus constituting a trade barrier. These costs are of two types. First, manufacturers may have to modify their products in order to comply with the different legal technical regulations of the foreign countries in which they want to sell their products. Making these alterations entails supplementary manufacturing costs (if, say, products must undergo additional manufacturing steps in order for them to fit it in with legal requirements in force in the export market) and/or development costs (if, for example, different types of products must be developed to meet legal specifications in the various export markets). Neither of these supplementary costs weigh on domestically produced and sold goods.

Only costs incurred specifically because of differences in legislation or standards can be counted as barriers to trade, not those costs related to their level. While all additional development costs that result from the need to develop variations of existing products in order to make them suitable for the various export markets clearly create obstacles to trade, the same cannot be said of additional manufacturing costs. Suppose a particular Member State has issued very demanding safety objectives, meaning that more expensive materials and components or a longer assembly time are required in order to meet them, which increase the costs of manufacturing the equipment covered by these objectives. The higher manufacturing costs do not derive from differences in legislation between countries and will need to be borne by both foreign and domestic suppliers. Therefore these costs do not constitute a trade barrier, but are simply the price that must be paid by everyone for this high level of safety.

A second type of cost caused by differences in legal technical regulations is that which arises as a result of conformity assessment. Often, tests and certification procedures are required to verify that a product conforms with a country's legal technical requirements. Trade barriers

Figure 3.1. Types of technical trade barriers and incidence in the food, drink and tobacco processing machinery industry



arise when the importing country does not recognize the certification obtained by manufacturers in their home country, forcing them to incur the supplementary cost and time delay of a replication of the tests and certification by an agency in the importing country.

Differences in industry standards entail the same types of costs as legal technical regulations. They may oblige manufacturers to modify their products in order to meet the particular specifications set out in the industry standards in use in other Member States. Furthermore, compliance with these standards must often be verified and certified by national agencies, burdening a foreign manufacturer with the costs of duplicative testing and certification.

The fact that industry standards are voluntary suggests that they can be avoided and thus do not constitute a trade barrier, in contrast with legal regulations. However, foreign manufacturers, although not legally obliged to comply with such industry standards and perfectly entitled to supply products made to the standards applicable in their home countries or to any other specifications, will often find that national industry standards are so widely in use that they become unavoidable. Then, manufacturers are practically compelled to offer products that conform to such local standards if they are to sell them.

The nature of barriers in the food, drink and tobacco processing machinery industry will be assessed below in the analysis of EU measures. The conclusions, though, can be summarized as follows. Technical barriers to trade in the food, drink and tobacco processing machinery industry mainly derive from differences in industry standards and only seldom from differences in legal regulations alone. However, the analysis below shows that the distinction between the two was not always clear-cut. The mechanism whereby industry standards

created barriers to cross-border trade was intrinsically connected with the practical implementation of legal regulations.

Where barriers arose, they stemmed mainly from the need for repeated conformity assessment procedures and less from having to modify equipment. The incidence of technical barriers in the food, drink and tobacco processing machinery industry was limited to a few types of machinery or components. The most important category affected was pressure equipment. Systems working under pressure have widespread applications in food processing (for example boilers and cooling coils) and are extensively covered by regulations and standards. Pressure equipment represents about 10% of the total output of food, drink and tobacco processing machinery.[12]

It is worth noting that other segments of the mechanical engineering industry producing special-purpose equipment that is not particularly hazardous faced the same sorts of barriers. From the results of this analysis of technical trade barriers in the food, drink and tobacco processing machinery industry, therefore, it can be extrapolated that these also affect a large part of the rest of mechanical engineering.

3.1.2. The Machinery Directive[13]

Scope and objective

The Directive introduces harmonized EU-wide rules governing the placing on the market and putting into service of machinery. It therefore replaces pre-existing national measures and prevents the creation of new barriers to trade in this field.

Trade barriers caused by national machinery regulation

No Member State has issued regulations aimed specifically at food, drink and tobacco processing machinery or segments of this industry. There were, however, in all Member States, legal provisions regulating machine safety that applied to all machinery, including equipment for food, drink and tobacco processing. These provisions were generally part of the legislation on worker safety, which dealt with all issues relating to the protection of workers at work and the safety and hygiene of the workplace. This body of national legislation is still in place, but has been modified to incorporate the provisions of the Machinery Directive as well as other relevant EU directives.

The legal provisions regulating machine safety could be broadly divided into two groups: general and specific. The first laid down general safety objectives that must be met by all equipment and established procedures for verifying compliance with these general requirements. Specific legislation was aimed at particular types of equipment that were deemed to pose significant health or safety hazards. It formulated additional requirements and conformity assessment steps, dealing with the specific risks of the equipment covered by the

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[12] Rough estimate of some of those in the industry. No statistics are available that break down industry production into these categories.

[13] Council Directive 89/392/EEC of 14 June 1989 on the approximation of the laws of Member States relating to machinery (OJ L 183, 29.6.1989, p.9). Amended by Directives 91/368/EEC (OJ L 198, 22.7.1991, p.16), 93/44/EEC (OJ L 175, 19.7.1993, p.12) and 93/68/EEC (OJ L 220, 31.8.1993, p.1).

legislation. The range of equipment covered by specific legislation varied from Member State to Member State and depended partly on the nature of industrial activity in the regulating country. Types of equipment that were frequently subject to specific rules included lifting equipment, woodworking equipment, presses and shears for metal-working, and milling or grinding equipment. Of these, only milling equipment has applications in food, drink and tobacco processing.

As the national provisions regarding machine safety were incorporated into worker and workplace safety legislation, they were primarily directed at users of equipment. In most cases, no tests or certification were required from the manufacturer prior to placing the equipment on the market. Instead, observance of the machine safety rules was verified by regular inspections on the users' premises after the equipment had been installed. These inspections did not cover only machine safety, but all aspects of workplace and worker safety. In certain specific cases, however, manufacturers were legally obliged to submit the product for inspection or provide other proof or declaration of conformity before they could be placed on the market. In other cases, such premarket control was strongly encouraged or, in fact, obligatory. (Appendix C provides a more detailed description of the machine safety legislation of nine Member States in 1985 prior to the single market programme.)

Problems arose in proving conformity with legal requirements to customers, who naturally wanted to buy equipment that complied with the local machine safety legislation. Here, national industry standards could become binding. As we saw earlier, machine safety regulations usually did not prescribe detailed technical specifications, but set out general objectives that had to be met by the product. To assist manufacturers in the interpretation of the general law, regulatory authorities issued technical guidelines demonstrating by which practical means the legal requirements could be satisfied. These technical guidelines made references to relevant national industry standards, which conferred authority on them. Thus, although the guidelines were not part of the law and therefore not legally binding, they provided manufacturers and users with a convenient means of complying with the law. Furthermore, they significantly facilitated proving conformity to the regulatory authorities, as a simple reference to the standards applied sufficed and no detailed proof needed to be produced that they had been adhered to. As a result, the national standards cited in such guidelines assumed a quasi-legal status. In this case, the customer demanded equipment built to national industry standards and certified as such to ensure compliance with safety regulations, even if the law did not call for these particular standards to be met nor require a certificate. The same situation arose when customers insisted on products conforming to local standards because this was required by their insurance policies if they were to be covered for damage and liability risks. Frequently, insurance companies will only insure machinery that is certified as meeting national industry standards.

Having said that, the barriers caused by the quasi-legal status of industry standards seem to have been limited to a few types of equipment or components posing more significant safety risks, which were therefore under closer scrutiny from regulatory authorities and insurance companies. Cited were protective guards, electrical parts and heating systems. In Germany, customers frequently demanded a GS or TÜV certification for hazardous components, obliging the supplier to apply German norms and have the relevant components certified by an accredited testing centre.

Ensuring and proving compliance with national industry standards entailed costs in the form of tests, administrative procedures and altering the equipment as required. Not all these costs could be regarded as a barrier to trade, however. A distinction must be made between costs arising from a lack of harmonization between national machine safety rules and costs stemming from a required level of safety that affects all manufacturers equally. Only the first type – costs arising from the absence of regulatory harmonization – should be counted as trade barriers. They increase the costs of those manufacturers active in several EU markets in comparison with those that only serve their domestic markets. Examples are duplication of tests and conformity declaration procedures, smaller economies of scale and additional development time involved in designing various versions of the same equipment in order to comply with different sets of regulations. In contrast, costs that arise because a particular level of safety or some other parameter needs to be met cannot be regarded as a barrier to trade. For instance, tougher standards in Germany for electrical parts were said to add 5–10% to the price of equipment destined for that market. However, most, if not all, of this additional cost stems from the higher standards in place in Germany which are borne by domestic as well as foreign suppliers. If there was an EU-wide harmonization of electrical safety standards that was pitched at the same level as those in Germany, this would not reduce the cost of supplying equipment to the German market very much for a non-German manufacturer. If, however, EU-wide harmonization was set at a lower level, this would reduce the cost of equipment sold on the German market, for both domestic and foreign manufacturers. However, it is more correct to attribute the cost savings in this case to a reduction in the standards set rather than to a harmonization of regulations.

Provisions of the Machinery Directive

Article 1 of the Directive defines its scope. With a few exceptions, the Machinery Directive applies to all machinery and safety components of machines that are sold separately but are to be used with them. One exception to this rule concerns particular types of equipment or hazards that are wholly or partly covered by specific EU directives. In these cases the specific directive applies and not the Machinery Directive.

Another category of equipment excluded from the scope of the Machinery Directive and relevant to the food, drink and tobacco processing machinery industry is pressure vessels. While simple pressure vessels (that is, those that are unfired and built in series) are already covered by a specific directive, the more important other types of pressure equipment are not yet subject to EU legislation. The Directive does not apply to components (apart from safety components as mentioned above), but, rather, to a functional machine with a specific application or to an assembly of such machines. On the basis of a Commission proposal of July 1993, the Council of Ministers adopted a common position in March 1996. At the time of writing, the common position had been forwarded to the European Parliament for a second reading.

Article 3 states that machinery must satisfy the essential safety and health requirements set out in Annex I to the Directive. These cover a wide range of safety-related machine characteristics, including: the principle of safety integration in design, safety and reliability of control systems, protection against mechanical hazards (covering issues such as stability, the risk of break-up, sharp edges, rough surfaces and moving parts), required characteristics of protective guards, protection against various hazards (such as electricity, extreme

temperatures, fire, noise, vibration, radiation, emissions of dust gases), requirements for safe maintenance and those for warning and information devices.

In addition to the essential requirements applicable to all machinery, the Annex lists a number of supplementary requirements for certain categories of machinery or particular hazards. One of these specific provisions relates to agri-foodstuffs machinery and adds certain hygiene requirements for this type of equipment. Essentially, they state that materials intended to come into contact with foodstuffs must satisfy the conditions laid down in the directives regulating that matter. Machinery must be designed and constructed so as to prevent the accumulation of organic material and allow thorough cleaning (by designing in smooth surfaces and joinings, curves of a sufficient radius to facilitate cleaning, easily accessible parts and so on). The essential health and safety requirements are expressed in general terms. They lay down the objectives that need to be achieved in the design and construction of machinery, but do not impose particular technical solutions or standards. Manufacturers are therefore free to choose the technical means by which they will comply with the requirements of the Directive.

Article 4 ensures the free movement of goods in the single market. It says that Member States are not allowed to prohibit or restrict the placing on the market or the putting into service of machinery that complies with the Directive.

Article 5(2) covers harmonized standards, which are technical specifications developed by European standardization bodies – that is, the CEN (European Committee for Standardization) or CENELEC (European Committee for Electrotechnical Standardization) – on a mandate from the Commission. Machinery built according to a harmonized standard is presumed to comply with the essential safety requirements of that standard. Harmonized standards therefore provide a 'fast-track' means of complying with the compulsory essential requirements. The harmonized standards themselves are not, however, compulsory. Even where a harmonized standard exists, the manufacturer is free to choose other means of satisfying these essential requirements.

In order to certify that machinery conforms with the directive, manufacturers (or their authorized representatives in the EU) must draw up an EC declaration of conformity for all units placed on the market and affix a CE marking to the machine. The declaration of conformity contains an identification and description of the machine, a list of all relevant health and safety requirements that have been complied with and references to the standards and specifications that were applied.

In addition, for each type of machinery placed on the market, manufacturers must draw up a technical construction file comprising drawings, test results carried out by themselves or third parties to check conformity, references to standards and technical specifications and, for series production, a description of internal production measures to ensure that the machinery conforms with the essential requirements laid down by the Directive. This technical construction file must not permanently exist, but it must be possible to assemble it in a suitably short time for inspection by the regulatory authorities.

If the machine is listed in Annex IV to the Directive, the conformity assessment procedure requires the intervention of a 'notified body'. A notified body is a third party that is competent to carry out the tasks relating to the evaluation of conformity and which has been designated by a Member State from among the bodies under its jurisdiction as meeting the criteria of

competence and notified to the Commission. The involvement of the notified body may range from safekeeping the above-mentioned technical file to EU-type examination of an example of the machinery. If manufacturers have applied harmonized standards referred to in Article 5(2), the intervention of the notified body can be kept to a minimum. Manufacturers need only then send the technical file to a notified body, which will acknowledge receipt and keep the file.

Annex IV is an exhaustive list of about 20 machinery types and safety components that are deemed to present greater hazards (sawing machines, some machines for underground work, rollover and falling-object protective structures and so on) and therefore need to be scrutinized more closely in matters of safety. None of the equipment types listed in Annex IV is relevant to food, drink and tobacco processing machinery.

The contribution of the Machinery Directive to the removal of technical barriers

The Machinery Directive lays down common health and safety requirements with which machinery must comply before it can be placed on the market in the EU. These essential requirements are underpinned by harmonized standards that provide a presumption of conformity with the provisions of the Directive. The Directive also establishes a common system of conformity assessment. As a result, manufacturers are legally entitled to place the same model of machinery on the market in every Member State, providing it meets the essential requirements and providing that they have fulfilled the relevant conformity assessment procedures. Because the Directive defines common safety requirements at EU level, Member States are not entitled to impose additional national requirements that would necessitate modifications having to be made to the product. Equally, they are not entitled to demand that national conformity assessment be performed before products can be placed on the market in their territory.

The Machinery Directive is a total harmonization directive. This means that its provisions replace the national regulations relating to machine safety. As regards legal barriers to trade in food, drink and tobacco processing machinery, the impact on single market integration was mainly preventive. In other words, it defined common EU-wide rules governing the placing on the market of such machinery, thereby avoiding the risk that national measures would erect barriers to trade.

As well as preventing new national regulations from erecting barriers to trade in food, drink and tobacco processing machinery, the Directive may be instrumental in removing other types of trade barriers. The CE mark and EC declaration of conformity that must accompany every machine may reduce demands from buyers of equipment for conformity and certification to national standards as a form of proof that the product meets legal safety requirements. Such a change in customer attitudes would reduce the need for costly modifications to be made in line with demands from purchasers that machinery comply with non-mandatory national standards. It would also reduce the need to obtain approval from national testing and certification institutes in every country where products will be sold, which is costly.

The EC declaration of conformity may become instrumental in removing the trade barriers caused by the quasi-legal status of some national industry standards. As mentioned above, for some components or safety aspects buyers of equipment insist on conformity to national industry standards and even certification that this is so because this ensured approval by local inspection authorities. However, now, the Machinery Directive holds that Member States

must regard machinery bearing the CE marking and accompanied by the EC declaration of conformity as complying with the essential requirements. Regulatory authorities can therefore not prohibit its being put into service, and so the barriers caused by the binding character of national industry standards in practical terms have been overcome.

The implementation of the Machinery Directive

The Machinery Directive came into force on 1 January 1993. By that date the Directive had to become national law and, from then onwards, the regulatory authorities were not allowed to restrict the placing on the market or putting into service of equipment that complied with the Directive. At the time of writing, the Directive has become law in all Member States except Italy.

The Directive took full effect on 1 January 1995, when the transition period ended. During this period, Member States could still allow equipment not conforming with the essential requirements laid down by the Directive onto the market. However, all machinery being sold in the EU for the first time since 1 January 1995 must comply.

Enforcement of the Directive is left to the Member States. In particular, when a Member State ascertains that a product bearing the CE mark does not comply with the requirements set by the Directive, it must take the appropriate measures to withdraw the product from the market and prohibit it from being sold there or used. It must also inform the Commission of these measures, indicating the reason for them and whether nonconformity is due to:

(a) failure to satisfy the requirements of the Directive;
(b) incorrect application of harmonized standards or other standards enjoying a presumption of compliance;
(c) shortcomings in the standards themselves.

This is the safeguard clause, enabling Member States to override the presumption of conformity conferred on machinery bearing the CE marking. The information procedure is intended to restrict arbitrary action by the Member States. The Commission must consult the parties involved and, after such consultations, inform the Member States whether or not the action was justified. If shortcomings in the standards are at issue, the Commission brings the matter before the standing committee set up under Directive 83/189/EEC, which delivers an opinion on the adequacy of the standard.

Enforcement methods are not harmonized across Member States, leading to two opposite concerns among those in the industry:

(a) that the safeguard clause will be abused, resulting in new trade barriers;
(b) that inspections in some Member States will be insufficient, giving manufacturers in these countries an unfair competitive advantage.

No specific concrete examples of these potential problems were reported.

Work on harmonized standards has progressed less than legislation, at least for the specific requirements applicable to food processing machinery. Technical Committee 53 of CEN, which is responsible for setting standards in this area, is working on 32 sets of harmonized

standards. So far, no standards for food processing machinery have been completed, although work on seven standards is at an advanced stage (see Table 3.1).

Table 3.1. Projects for harmonized standards covering food processing machinery (seven standards near completion)

PREN	Description
1678	Food processing machinery – vegetable cutting machines – safety and hygiene requirements
454	Food processing machinery – liquid mixers – safety and hygiene requirements
1674	Food processing machinery – dough and pastry brakes – safety and hygiene requirements
1673	Food processing machinery – rotary ovens – safety and hygiene requirements
453	Food processing machinery – plough mixers – safety and hygiene requirements
1672 -1	Food processing machinery – safety and hygiene requirements – basic concepts: safety
1672 -2	Food processing machinery – safety and hygiene requirements – basic concepts: hygiene

Work on general harmonized standards either dealing with fundamental concepts concerning all machinery (A standards) or with safety aspects concerning a range of machinery (B standards) has advanced much further. Generic harmonized standards dealing with most general essential safety requirements included in the Machine Directive are now in place.

While technical harmonization does not depend on the existence of harmonized standards, which are voluntary, the completion of harmonized standards substantially enhances the effectiveness of regulatory harmonization in achieving an integrated single market. You will recall that trade barriers in the machinery industry are often related to the quasi-legal status of principle voluntary national industry standards. Furthermore, some of the companies surveyed reported that they expect that the harmonized standards being developed will, on their completion, become accepted as an industry-wide standard. They therefore prefer to wait for these standards to be completed before they will modify and standardize the equipment they manufacture.

3.1.3. The Directive on the use of work equipment

The scope and objective of the Directive

Article 118A of the EC Treaty authorizes the Council to adopt, by means of directives, minimum requirements for the protection of worker health and safety. Under this, the Council has issued Directive 89/655/EEC,[14] which lays down minimum safety and health requirements for the use of work equipment by workers at work.

[14] Council Directive of 30 November 1989 concerning the minimum safety and health requirements for the use of work equipment by workers at work (second individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC) (OJ L 393, 31.12.1989, p.13).

Provisions

The Directive imposes several obligations on the employer to ensure that work equipment can be used by workers without risk to their safety or health. In particular, the employer must issue suitable and safe work equipment, provide workers with adequate information on the work equipment and make sure that workers receive adequate training to operate the equipment.

Concerning the work equipment itself, the Directive rules that all equipment put into service after 31 December 1992 must comply with all relevant EU directives (that is, the Machinery Directive or other directives applying to certain specific types of equipment) or, when no other EU directives are applicable, with the minimum requirements laid down in the Annex to the Directive. Equipment in use before 31 December 1992 must comply with the minimum requirements set out in the Annex no later than four years after that date. The minimum requirements in the Annex to the Directive on the use of work equipment are similar to the essential safety and health requirements listed in Annex I to the Machinery Directive, but their phrasing is different and more concise.

Its contribution to the removal of technical barriers

The Directive on the use of work equipment harmonizes the minimum safety requirements imposed by national workplace safety regulations. As a result, if manufacturers construct their equipment in compliance with the requirements set out in the Directive, they will also meet all the requirements of the national workplace safety regulations and thus be able to commercialize their equipment without hindrance throughout the EU. In turn, buyers of equipment are assured that if they purchase equipment that complies with the minimum requirements, they will also meet national workplace safety regulations.

Article 118A is part of the social policy title of the Treaty, not of the title on the free movement of goods. It states that the Member States will improve the working environment and will seek harmonization in this area. To achieve this, it authorizes the Council to adopt, by means of directives, minimum requirements. The legislation based on Article 118A thus pursues two objectives: a social policy goal (to improve health and safety at work) and a single market goal (harmonization of legislation). The essential difference with the harmonization directives issued under Article 100A of the Treaty (such as the Machinery Directive) is that the measures based on Article 118A only establish minimum rules. Member States are allowed to maintain or introduce stronger requirements on health and safety at work, thereby again risking a fragmentation of the single market. In the case of machine safety, however, the scope for doing so is explicitly restricted by the harmonization directives based on Article 100A. For instance, the Machinery Directive clearly states that Member States are allowed to lay down any additional requirements as they deem necessary to ensure that workers are protected when using the machinery, but only under the condition that this does not imply making modifications to the machinery. Thus, machinery complying with the essential health and safety requirements laid down by the Machinery Directive and bearing the CE marking to certify this must be accepted without restrictions by the national authorities that inspect premises with regard to workplace safety. Member States have incorporated this principle in their worker and workplace safety legislation.

3.1.4. Other single market legislation

The harmonization of the technical regulations for industrial equipment

In addition to the Machinery Directive, other directives have been adopted to enable Member States to harmonize and approximate each others' regulations that relate to various types of industrial equipment (these are listed in Table 3.2). Compared to the Machinery Directive, their impact on the food, drink and tobacco processing machinery industry is much more limited.

Table 3.2. Other directives covering industrial equipment

Directive	Area of application
73/23/EEC	Low-voltage equipment
87/404/EEC	Simple pressure vessels
89/336/EEC	Electromagnetic compatibility (EMC)
94/9/EC	Equipment for use in potentially explosive atmospheres

With the exception of the Low-voltage Equipment Directive, all the directives listed in Table 3.2, as well as the Machinery Directive, are part of the new approach to technical harmonization. Furthermore, the Low-voltage Equipment Directive, though an exception, is still in the spirit of the new approach. It has served as a model for this new approach and has been amended in line with the other new approach directives by Council Directive 93/68/EEC.[15]

All the new approach directives lay down essential health and safety requirements with which products must comply. The directives listed in Table 3.2 therefore function in a very similar way to the Machinery Directive. Equipment satisfying their essential requirements and following the appropriate conformity assessment procedure enjoys free movement throughout the EU. The drawing up of harmonized standards, which confer a presumption of conformity with relevant essential requirements, is left to European standardization bodies because of a mandate from the Commission. Although harmonized standards provide this presumption of conformity, they are voluntary and so manufacturers are free to choose other technical means to achieve the essential requirements laid down by directives. To certify that their equipment complies with the relevant directives, the manufacturer affixes the CE marking and fulfils any other conformity assessment steps prescribed by these directives.

The Low-voltage Equipment Directive[16] applies to all electrical equipment with a voltage rating of between 50 and 1,000V for alternating current and between 75 and 1,500V for direct current. Food, drink and tobacco processing machinery, falling within these voltage limits, therefore has to meet the safety objectives established by this Directive.

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15 OJ L 220, 31.8.1993, p.1.

16 73/23/EEC (OJ L 77, 26.3.1973, p.29).

The Pressure Vessels Directive[17] lays down safety requirements for simple pressure vessels – welded vessels manufactured in series to contain air or nitrogen and not intended to be fired. The relevance to the food, drink and tobacco processing machinery industry of this Directive is limited. Such vessels may be a small component of food processing plants, but they are usually not produced by the industry. Instead, they are purchased from specialized producers.

The Electromagnetic Compatibility (EMC) Directive[18] addresses the need to prevent electromagnetic disturbance, which can harm radio communications and the performance of electrical and electronic equipment. It establishes two general requirements:

(a) that the electromagnetic emissions of equipment must be sufficiently small as not to disturb the operations of other equipment;
(b) that the degree of immunity of equipment must be adequate, to the extent that it will be unhindered by the level of disturbance generated by other equipment that complies with the Directive.

The EMC Directive has no counterpart in national legislation. Except in the area of telecommunications, national authorities have not regulated electromagnetic compatibility. Most regulation in this area is issued by electricity distributors, who impose limits on the disturbance that may enter the electricity grid from equipment connected to it.

The Directive covers any apparatus, equipment system or installation containing electrical and/or electronic components liable to create electromagnetic disturbance or whose performance is liable to be affected by such disturbance. Manufacturers of food, drink and tobacco processing machinery falling within this definition can affix the CE mark on the basis of a declaration of conformity, if they have followed the relevant harmonized standards. Where there are no harmonized standards or they have not been fully applied, the manufacturer has to draw up a technical construction file and submit it to a competent body in order to obtain a certificate or technical report.

The Directive on equipment for use in potentially explosive atmospheres[19] lays down a broad set of safety objectives for the design and construction of equipment intended for use in places liable to be endangered by explosive atmospheres. Such situations occur in a few areas of food processing, notably in the handling of dry raw materials (like grain and sugar). Electrical equipment for use in potentially explosive atmospheres was already harmonized by 'old approach' directives.[20] The new Directive replaces the existing directives and extends the scope to non-electrical products and protective systems.

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17 87/404/EEC (OJ L 220, 8.8.1987, p.48).

18 89/336/EEC (OJ L 139, 23.5.1989, p.19).

19 94/9/EC (OJ L 100, 19.4.1994, p.1).

20 Directives 76/117/EEC (OJ L 24, 30. 1.1976, p.45), 79/196/EEC (OJ L 43, 20.2.1979, p.20) and 82/130/EEC (OJ L 59, 2.3.1982, p.10) and their amendments to incorporate adaptations to technical progress.

The harmonization of regulations concerning materials intended to come into contact with foodstuffs

Since 1978, about ten directives have been adopted on the harmonization of Member State regulations relating to materials intended to come into contact with foodstuffs. The most important of these is the Framework Directive 89/109/EEC,[21] which lays down general requirements for materials and articles and paves the way for specific directives covering particular materials, such as plastics, cellulose film, paper and board, glass, metals, wood, and so on. Up to today, only an Implementing Directive on plastics has been adopted.[22] Older directives cover certain plastics and ceramic articles.

The directives adopted so far on materials intended to come into contact with foodstuffs are of little or no relevance to machinery, concerning as they do mainly packaging materials. No barriers in this area were reported by those in the industry.

3.2. The implementation of horizontal measures with an impact on the food, drink and tobacco processing machinery sector

Companies active or selling products in more than one country bear several supplementary costs that are not incurred by those operating only in a single country. One of these, namely the cost arising from the obligation to meet different sets of product-specific regulations or standards in other countries, has been discussed earlier. In addition, however, there are many non-product-specific costs that weigh in varying degree on any firm operating in different countries with separate legal, administrative and fiscal systems. The measures taken to address these barriers will be examined in this section.

3.2.1. The abolition of customs formalities and border controls

Barriers to trade caused by customs formalities and border controls

Trade is by far the most frequent type of cross-border transaction in the food, drink and tobacco processing machinery industry. Only the largest firms operate subsidiaries in more than one country and engage in extensive non-trade cross-border business activities.

The extensive customs formalities that existed before the single market programme increased administrative costs, both internal and in the form of fees to agents. Controls of goods and documents at the border brought about time delays, thereby increasing transportation costs. These costs were too insignificant to be a deterrent to cross-border sales, but were simply regarded as annoying.

A study carried out in 1987 by Ernst and Whinney[23] on the cost of border-related controls and administrative formalities found that these costs amounted to about 1.5% of intra-EU trade.

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21 Council Directive 89/109/EEC of 21 December 1988 on the approximation of the laws of the Member States relating to materials and articles intended to come into contact with foodstuffs· (OJ L 40, 11.2.1989, p.38).

22 Commission Directive 90/128/EEC of 23 February 1990 relating to plastics materials and articles intended to come into contact with foodstuffs. (OJ L 75, 21.3.1990, p.19)

23 Ernst and Whinney, 'The cost of non-Europe: Border-related controls and administrative formalities', in European Commission, *Research on the 'Cost of non-Europe': Basic findings*, Vol. 4, Office for Official Publications of the European Communities, 1988.

The costs per consignment were 30–45% higher for firms with fewer than 250 employees than for larger firms. The engineering firms in the sample reported, on average higher border-related costs, these corresponding to about 2.4% of internal trade.

No quantitative estimates of the cost of border-related costs and customs formalities in the food, drink and tobacco processing machinery were obtained. Only a few of the companies that were interviewed could comment on this matter and thought that the costs were rather smaller than 1.5%. Customs formalities were regarded as an annoyance more than a significant cost.

Single market measures

Under Article 7A of the EC Treaty, all customs formalities and border controls were abolished for trade between Member States from 1 January 1993. Proof that products originate in the EU is provided solely by their invoices, which, like in domestic trade, are the only necessary documents for sales transactions between parties in two Member States.

Already in 1988, customs documentation was simplified by the introduction of the Single Administrative Document (SAD), which replaced the separate forms for imports, exports, transit and so on. The SAD remains in use for trade with countries outside the EU, but has since been abolished for transactions between Member States.

Customs formalities served a variety of purposes. One of these was the collection of statistics on the movement of goods between Member States and tax administration. Their abolition therefore required new arrangements to be introduced in order to fulfil these functions. A new statistics collection system, INTRASTAT, was established to allow statistics on intra-EU trade to continue to be compiled. This system requires businesses periodically to declare their trade transactions with parties in other Member States, which elicits some complaints about the administrative burden this puts on companies.

With respect to the levying of VAT, no essential changes occurred for business-to-business sales, but the burden of the declaration procedure was considerably eased. As before, buyers do not pay VAT to the seller on purchases from another Member State. Instead, the VAT on the purchase of equipment from another Member State is payable by the buyer in the country of destination. To this end, the buyer enters the VAT due on the regular periodic returns and, at the same time, deducts the same amount as the VAT that is paid on inputs. Hence, as under the former regime, there is no prefinancing of VAT by firms on intra-EU transactions.

The abolition of customs formalities has ended the VAT declaration by consignment, thereby reducing the amount of administration required. VAT must only be declared on the periodic returns. As invoices are now the only required document for sales within the EU, they must mention the VAT registration numbers of the parties to the transaction.

3.2.2. The liberalization of international road haulage

Barriers to trade caused by restrictions in international road haulage

Prior to 1992, international road haulage between Member States was restricted by a permit system. To transport loads to or from another Member State, hauliers needed a permit. Bilateral permits allowed them to carry goods between their home country and the partner

country. The scarcer Community permits licensed hauliers to engage in cross-border (but not domestic) transport anywhere in the EU.

The permit system reduced competition and decreased operating efficiency (because of the increased number of empty return trips). As a result, over equal distances, international transport tariffs were higher than domestic tariffs. Again, however, the impact this had on costs was too insignificant to be a deterrent to trade. Transport costs represent less than 1% of production value in the food, drink, and tobacco machinery industry.

Single market measures

In the field of road haulage, EU legislation has fully liberalized international road transport services. The quantitative permit system was replaced by set of qualitative conditions for access to the profession and the market, laid down by Council Regulation (EEC) No. 881/92.[24] Every road haulier meeting the requirements has the freedom to provide cross-border transport services anywhere in the EU. From 1 July 1998, hauliers will also be allowed to provide domestic transport services in any Member State (cabotage). This will complete the establishment of a single EU-wide road transport market.

3.2.3. Measures to remove barriers to non-trade cross-border business activities

Various measures have facilitated non-trade international business transactions in the EU. While they have not resulted in perceptible changes in performance or behaviour in the food, and drink and tobacco processing machinery industry, they were regarded as having a positive impact by respondents to the postal survey.

Council Directives 90/434/EEC[25] and 90/435/EEC[26] eliminated fiscal obstacles to the efficient management of European multinational enterprises. The first introduced a common system of taxation applicable to mergers, divisions, transfers of assets and exchanges of shares. In particular, it stipulates that capital gains arising from these operations are not taxed at the time, but only when they are effectively realized. This facilitates cross-border restructuring operations within the EU.

The second Taxation Directive created a common system for the taxation of parent companies and their subsidiaries in another Member State. It provides that profits of a subsidiary company in one Member State distributed to the parent company in another Member State are exempt from withholding tax on dividends at the level of the subsidiary and from corporation tax at the level of the parent company, thereby avoiding double taxation. The problem of double taxation is not entirely eliminated by this, however. For instance, it is still impossible for a company to take into account on its income tax return losses incurred by subsidiaries in other Member States.

Regulation (EC) No. 40/94[27] established the Community trade mark system. Community trade marks are granted by the Office for Harmonization in the Internal Market (trade marks

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[24] OJ L 95, 9.4.1992, p.1.

[25] OJ L 225, 20.8.1990, p.1.

[26] OJ L 225, 20.8.1990, p.6.

[27] OJ L 11, 14.1.1994, p.1.

and designs), based in Alicante, Spain. These trade marks are registered for a period of ten years, and renewable for a further ten.

The Community system has significant practical advantages. A single procedure is all that is required to obtain a trade mark that is valid throughout the EU, one that is governed by common provisions and enforced by a quasi-judicial body, the Office for Harmonization's Board of Appeal. Under the former system, which is still available, proprietors wishing to obtain protection in all Member States were obliged to register their trade marks with the intellectual property offices of all Member States and Benelux. Each registration involves a separate administrative procedure and the trade marks conferred are subject to the specific rules of the State concerned. The administrative burden of this procedure could be alleviated by using the services of the World Intellectual Property Organization (WIPO), in which case two procedures – one domestic and one with the WIPO – suffice. However, proprietors still receive one registration per country, governed by national regulations. Furthermore, not all Member States are members of WIPO.

The Community trade mark system has barely started its operation. Companies in the food, drink and tobacco processing machinery industry are likely to exploit the advantages offered by the new system. They make extensive use of trade marks and patents as a means of building an image of technical competence and quality.

3.3. Remaining regulatory and administrative obstacles

3.3.1. Pressure equipment

Pressure equipment has widespread applications in food, drink and tobacco processing machinery (for example, boilers, cooling coils, sterilization equipment, steam-heated equipment). Systems using pressure account for some 10% of the output of this sector. It is the only type of equipment manufactured by the food, drink and tobacco processing machinery industry that is subject to extensive national regulations but not covered by any EU legislation. Only simple pressure vessels (that is, those that are unfired and produced in series) have been the object of a Community directive,[28] but these are of minor relevance to the food, drink and tobacco processing machinery industry. A Framework Directive 76/767/EEC[29] provided for a bilateral recognition procedure for the testing and verification of equipment satisfying national provisions. The Directive is optional and has proven unsuccessful.

Pressure equipment was cited most frequently in the postal surveys and interviews as encountering obstacles to cross-border sales.

National regulations and industry standards concerning pressure equipment

Because of the large number of parameters, a detailed comparison between the rules on pressure equipment between countries is impossible. Pressure equipment is differentiated in

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[28] Council Directive 87/404/EEC of 25 June 1987 on the harmonization of the laws of the Member States relating to simple pressure vessels (OJ L 220, 8.8.1987, p.48), amended by Directives 90/488/EEC (OJ L 270, 2.10.1990, p.25) (extension of transition period) and 93/68/EEC (OJ L 220, 31.8.1993, p.1) (modification of conformity marking).

[29] Council Directive 76/767/EEC of 27 July 1976 on the approximation of the laws of the Member States relating to common provisions for pressure vessels and methods for inspecting them (OJ L 262, 27.9.1976, p.153).

volume (from a few cubic centimetres to thousands of cubic meters), operating temperature (from the temperature of fluid helium to hundreds of degrees Celsius), pressure level (from vacuum to thousands of bar), construction material (metal, glass, ceramic, plastic) and content (fluid or gas, toxic, combustible, corrosive).

Each of these parameters influences the degree of risk and so may affect the specific regulatory requirements imposed on the equipment. Nevertheless, a broad overview suggests that often it is not just the legislation that creates barriers to trade. The main hindrance to cross-border sales stems from national industry standards. However, the binding nature of what are in principle voluntary industry standards is intrinsically connected with the practical enforcement of national legislation. Many customers insist that equipment be built to local standards and certified as such to ensure that it will meet with the approval of their regulatory authorities and because their insurance policies require it. The situation varies by country, though.

In the United Kingdom, no specific legislation on pressure systems exists. This equipment is, of course, subject to the general machine safety rules and is covered within the workplace inspections instituted by that legislation.

The UK also has very few private standards that apply to pressure equipment. Norm BS 5500, which has been developed by the British standardization body BSI, only covers unfired pressure vessels produced in series and is not very important for food, drink and tobacco processing machinery. BS 5500 emphasizes the technical qualification of the employees and the quality of the production process, which are inspected and certified by a private Pressure Vessels Quality Assurance Board.

The German law on pressure equipment lays down safety objectives. The technical means to achieve these objectives are not specified by the law, but left to 'generally recognized technical norms'. By themselves, therefore, the legislative rules do not create obstacles to trade as any competent manufacturer can reasonably argue to construct their equipment according to good engineering practice. Problems arise in conformity assessment. The law mandates testing and lays down the testing conditions. The testing agencies are licensed by the regional authorities and so it is difficult to obtain acceptance of the results of tests performed in other countries. In addition, German standards for the materials, construction and testing of pressure equipment that satisfy the safety objectives of German law have been developed by the Arbeitsgemeinschaft Druckbehälter (AD), which unites various groupings of industries, experts and testing bodies involved in the design, manufacture and testing of pressure vessels and equipment. The AD standards are cited in the law as examples, but are not legally binding. In practice, however, all customers require manufacturers to conform with the AD standards and verification of this by recognized testing agencies.

In France, the law is more detailed and specific than in Germany. In addition to laying down safety objectives for pressure equipment, a substantial part of the technical norms that need to be applied to meet the objectives are included in mandatory legislation, in particular those regarding welding and materials. Furthermore, testing is mandatory and must be conducted by one of the testing agencies that has been recognized by ministerial decree. France also has a well-developed set of industry standards. The Federation of Pressure Equipment Manufacturers, in collaboration with the Association of Pressure Equipment Engineers, has issued the CODAP (Code de construction des appareils à pression (pressure equipment

construction code)) standards, which fill in the safety requirements laid down by the law. As in Germany, the standards are voluntary, but de facto binding.

Finally, the legislation is very detailed in Italy and the Netherlands, with almost all safety aspects of pressure equipment being subject to mandatory technical norms.

Barriers to trade

Companies reported that they developed and built several versions of the equipment or of some components in order to comply with regulations or standards in another country. However, it was never necessary to develop a different version for each set of national regulations or standards. Three or four types – for instance, one built to domestic, one to German and another to American standards – sufficed to meet requirements in all export markets world-wide. The additional development cost associated with offering multiple versions of products clearly constitutes a barrier to cross-border sales, but no manufacturer could provide quantitative estimates of this.

Pressure equipment must be tested and certified before it is put on the market. Tests are mandated by specific regulations or, where no such regulations exist, they are usually required by the general machine safety inspection or insurance policies. Tests performed in the home country are, in most instances, not accepted in the importing Member State or only after certification from a local certification agency. Consequently, the certification and frequently also the tests must be repeated, imposing discriminatory costs on cross-border sales. Even when the law does not demand testing and certification, end-users may insist on certification being from a national organization to avoid potential problems with machine safety inspection or their insurance.

The duplication and repetition of tests are only a barrier to cross-border sales of machinery subject to type-testing, which is smaller or less dangerous pieces of equipment, such as cooling coils or small sterilization units. Large equipment (such as steam-heated dryers or boilers) are tested and approved unit by unit. Both foreign and domestic suppliers must have tests carried out for all units they place on the market, so that cross-border and domestic sales bear the same conformity assessment requirements.[30] The cost of testing and certification varies, but rarely exceeds 1% of equipment value per unit sold.

Community legislation

The Directive on the approximation of the laws of the Member States concerning pressure equipment is at an advanced stage of drafting. On the basis of a Commission proposal of July 1993, the Council of Ministers adopted a common position in March 1996. At the time of writing, the common position had been forwarded to the European Parliament for a second reading.

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30 Foreign suppliers may nevertheless incur higher travel and transport costs because they must use the services of distant testing centres in the importing Member States rather than nearby ones in their home country.

Like the Machinery Directive, it is based on the new approach to technical harmonization and standards.[31] It employs similar methods to those used to remove the barriers caused by differences in national regulation. The scope of the proposed Directive extends to pressure equipment subject to a pressure greater than 0.5 bar (or less than -0.5 bar). The proposed Directive lays down the essential requirements this equipment must satisfy. These requirements are listed in Annex I to the proposed Directive and concern the design (including calculation methods and testing programme), manufacturing methods and materials used to make pressure equipment. Additional requirements apply to fired pressure vessels and piping.

The essential requirements are largely expressed in general terms. They spell out design objectives and manufacturing procedures that must be followed, but leave manufacturers free to choose which technical means and specifications they will use to meet the stated objectives. Equipment conforming to harmonized standards developed by the CEN or CENELEC are presumed to comply with the essential requirements set out in the Directive. Where they exist, harmonized standards provide the manufacturer with a convenient means of complying with the Directive. However, they remain, voluntary.

Member States are not allowed – on the grounds of hazards due to pressure – to prohibit or restrict the placing on the market or putting into service of pressure equipment that complies with the Directive and bears the CE marking. This clause ensures the free movement of equipment in the single market.

The Directive establishes a modular conformity assessment procedure, ranging from internal production control with little or no intervention from third-party inspection bodies, to EU unit verification where a third party must examine the design and construction of each item of pressure equipment. Pressure equipment is classified according to risk, which depends on the pressure level, volume (or nominal size for piping), nature of the fluids to be contained and whether the vessel is fired or heated. The conformity assessment modules to be applied, and the degree of intervention from third-party certification bodies, is determined by the level of risk. For most pressure equipment, the proposed Directive will make some intervention by third parties obligatory, as is now the case under national regulations.

Certain types of pressure equipment are exempt from the requirements imposed by the Directive, even if they are subject to a maximum allowable pressure exceeding 0.5 bar. For instance, this is the case for all vessels with a volume of less than 0.1 litre as they do not present a significant hazard due to pressure.

3.3.2. VAT registration

In the field of cross-border trade, the abolition of customs formalities for intra-EU trade and the associated simplification of VAT declarations on sales to other Member States did also

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[31] The 'new approach' to technical harmonization and standards was introduced by a Council Resolution adopted on 7 May 1985 (OJ L 136, 25.5.1985, p.1). It has so far been applied to harmonize the regulation of a dozen types of products. The distinguishing characteristic of the new approach is that legislative harmonization is limited to the adoption of the essential requirements products must satisfy to protect health, safety and the environment. These requirements are expressed in general terms. They spell out the objectives that must be met by a product but do not impose particular technical solutions or standards. The latter had meant that many 'old approach' harmonization attempts became bogged down. The drawing up of technical specifications is instead entrusted to European standardization bodies such as CEN or CENELEC.

lead to the creation of new obstacles in a few cases. Those in the industry mention that, in some instances, exporters are required to have local VAT registration for the invoicing of work and spare parts related to the installation and repair of equipment because these are regarded as locally supplied goods and services. This means that non-domestic manufacturers must have local VAT registration in order to sell and install machines, even if they have no local facilities. Such a requirement is especially burdensome for small to medium-sized enterprises that make infrequent sales in a given country.

4. The impact of the single market on sectoral performance

4.1. Changes in market access resulting from the single market programme

So far, the measures adopted in the implementation of the single market programme have had only a limited impact on the food, drink and tobacco processing machinery industry. There are two principal reasons that explain why significant changes in market access have not been forthcoming. First, barriers to trade in food, drink and tobacco processing machinery were relatively low. Second, in the selected segments where regulatory barriers occurred, they have been slow in disappearing due to inertia. It should be noted, however, that many relevant measures have only come into force in the last few years.

The analysis in the preceding chapter showed that in much of the food, drink and tobacco processing machinery industry regulatory barriers were relatively low. Most of the equipment manufactured by the industry was not subject to any specific national regulations, but only covered by the provisions relating to machinery in the general worker and workplace safety legislation. This legislation did not cause significant barriers to cross-border sales of equipment. Its provisions were expressed in general and similar terms across Member States and only rarely obliged manufacturers to modify their equipment in order to comply. Furthermore, most equipment – including nearly all equipment relevant to the food, drink and tobacco processing machinery industry – could be placed on the market without the need for prior inspection or certification.

In the selected segments where alterations need to be made to equipment before it could be legally commercialized in another Member State (pressure equipment, electrical parts), the widespread practice in the food, drink and tobacco processing machinery market of customizing equipment anyway for customers reduced the impact of this factor on manufacturer's costs. To produce customized machinery involves an engineering stage where the equipment is fitted to the particular requirements of the end-user. To incorporate additional or different safety features brings with it little or no supplementary development cost. Of those who responded to the survey, 90% reported that they manufactured the same equipment to various specifications, largely to meet specific customer requirements. Only 10–15% altered specifications solely to comply with regulations in another Member State.

If modifications did entail additional costs, these often stemmed from a higher level of standards or regulations in another Member State, not from the absence of harmonization. The supplementary costs incurred as a result of conforming to regulation are borne by domestic as well as foreign suppliers and so they do not constitute a barrier to trade. A case in point are the tougher standards in place in Germany for electrical parts, which were said to add 5–10% to the price of machinery destined for that market. An EU-wide harmonization of electrical safety standards set at the German level would not appreciably reduce costs of supplying equipment to the German market for a non-German manufacturer. However, an EU-wide harmonization set at a lower level would reduce the cost of equipment sold on the German market, for both by domestic and foreign manufacturers. In this case it would then be more correct to attribute such cost savings to a reduction of the level of regulation rather than to the harmonization of regulations.

In the areas where significant restrictions to market access occurred, their removal has been slow. Pressure equipment does not yet benefit from harmonized regulation, but, as mentioned in the last chapter, a Directive covering this area is at an advanced stage of drafting (the Council has adopted a common position on the Commission's proposal and this has now been forwarded to the European Parliament for a second reading). As pressure equipment is the segment in which most obstacles to sales in another Member State were reported, the proposed Directive is likely to have a significant impact once it is implemented.

In the other segments of food, drink and tobacco processing machinery, it was mainly specific customer demand that obliged manufacturers to construct equipment to meet particular industry standards and have it certified as so doing. Customers insist on conformity with national standards to ensure that it will be approved when it is inspected. In the transpostition of harmonization directives, Member States have modified their workplace safety legislation so that compliance with the relevant directives is required and is sufficient to establish that workplace safety provisions are being met. This should harmonize the safety specifications customers demand be complied with by their equipment suppliers. In practice, however, many buyers for the moment continue to require that the same national standards be met as before, even though compliance with the new approach directives (and other relevant directives) is sufficient to satisfy the provisions of legislation on health and safety in the workplace. It is likely that such demands will become less common as familiarity with the CE mark and other provisions of the new approach directives increases.

As we saw earlier, a second important reason that customers demand compliance with national standards is that they want to ensure that they will be covered by their liability insurance. In many cases, insurance policies require that equipment conforms with national standards. While the private use of standards by industry falls outside the scope of EU legislation, insurance companies may come to accept the EC declaration of conformity as a sufficient guarantee that equipment has been designed with adequate regard to safety.

However, it takes time for the perceptions and behaviour of users of equipment, inspection authorities and insurers to change. Much of the EU's legislation on the harmonization of laws relating to equipment has only very recently come into force (the Machinery Directive only fully came into force on 1 January 1995, when its transition period ended). One Danish manufacturer of baking equipment reported that he had to persuade his customers to accept the EC declaration of conformity as a sufficient guarantee of safety. He met with success in most Member States, but in Germany and the UK many buyers continued to require conformity with national standards, especially those pertaining to electrical parts.

The above explains why so few of those who responded to the survey reported changes in the need to modify equipment or cost of conformity assessment. The findings are presented in Table 4.1.

Less than a tenth of companies have been able to simplify their product lines as a consequence of the harmonization of health and safety regulations. When asked which factors prevented them from reducing the number of models, they indicated, in declining order of importance:

(a) specific customer requirements;
(b) the continued existence of differences in national safety regulations or their application;

Table 4.1. Survey evidence on the impact of regulatory harmonization on the removal of technical barriers

Percentages of companies reporting to:	All	Medium-sized and large[1]	Small[2]
have been able to reduce the number of variants or models produced because the same model will now comply with the regulations of all Member States;	8%	11%	0%
affix the CE marking to the equipment sold;	85%	92%	73%
of those responding 'Yes', percentages reporting that the cost of conformity assessment has:			
(a) decreased	0%	0%	0%
(b) remained the same	76%	75%	80%
(c) increased	24%	25%	20%
of those responding 'Yes', percentages reporting that products carrying the CE marking are admitted into the markets of other EU Member States without further local inspections.	64%	59%	73%

[1] Those with 100 employees or more.
[2] Those with fewer than 100 employees.
Source: DRI survey of manufacturers.

(c) the desire to wait for the completion of industry standards, not only European norms (EN), but also international standards (ISO).

Customer demand was by far the main reason for offering a varied range of equipment. Several companies said that because of the extensive customization of equipment, they did not expect significant benefits from the harmonization of regulations.

Some 85% of the companies that replied to the survey affix the CE marking to the equipment they sell. Most of the others supply components and are not covered by the obligation to demonstrate conformity with EU legal requirements. A few respondents claimed that they were unaware of the directives on technical harmonization and the CE marking. Not a single company that was using the CE marking reported a reduction in the cost of conformity assessment. In all, 76% of them consider that this cost has stayed the same, while 24% have experienced an increase.

In contrast with the former national arrangements, where the onus of proving compliance primarily rested with the end-user of the equipment and most often no prior certification by the manufacturer or importer was required, EU legislation places the obligation of declaring conformity on the manufacturer in all cases. For most equipment types, self-declaration by the manufacturer suffices and the procedure is very simple. Furthermore, the use of the CE marking on equipment may eventually simplify the verification of machine safety on the user's premises by national workplace safety inspection and therefore contribute to a reduction in conformity assessment costs at that level. This does not detract from the fact, though, that no savings are visible to the supplier.

It should be remembered that pressure equipment, which is subject to national testing and certification prior to its being placed on the market and where harmonization could result in a lower conformity assessment cost, is not yet covered by EU rules.

A third of the respondents reported that the CE marking does not always suffice to place the machine on the market in another Member State, that there are often further requirements. This does not mean that a third of the equipment sold under the CE label is subject to additional local inspections, but that some of the equipment manufactured by a third of companies must pass conformity tests beyond that required by EU legislation. In most cases, the machinery concerned is not yet covered by EU legislation, such as, again, pressure equipment.

Table 4.2 presents the survey evidence of the impact of horizontal measures adopted in the framework of the single market programme. Horizontal measures are aimed at removing various non-sector-specific barriers to cross-border sales and other transactions. The table shows the percentages of replying companies that reported a positive impact from the measures on their businesses. The other respondents said that they had experienced no significant effects, while no company indicated that they had had a negative impact.

Unsurprisingly, the abolition of border controls and customs formalities were most often cited as having brought benefits, especially by small firms. Trade is the most frequent form of cross-border operation in the food, drink and tobacco processing machinery industry. Nevertheless the positive appraisal rate of 60% is significantly lower than in the Eurostat Business Survey,[32] where the percentage of companies reporting a positive impact from the elimination of customs formalities exceeds 80% in most sectors. A possible explanation for the cooler reception in this survey is the fact that it posed one combined question regarding the elimination of customs formalities and the change in VAT procedures as they are intrinsically related. Eurostat's questionnaire separated both issues and found that the new VAT regime elicited far fewer positive reactions than did the elimination of customs formalities, with most firms being neutral.

High scores (about a third of respondents, and typically higher than the response on the corresponding questions in the Eurostat Survey) were also achieved for the actions to provide EU-wide protection of property rights, the elimination of restrictions on capital transfers and actions to avoid double taxation. The appraisal concerning the protection of property rights probably relates to the anticipated benefit in the future as the European trademark office was not yet operational at the time of the survey. Patents and trade marks are indeed widely used in the food, drink and tobacco processing machinery industry, not to control markets or technologies, but, rather, as an instrument for marketing and image creation.

With the exception of the simplification of border formalities, the horizontal measures have been of more benefit to larger than to small companies. This is because the latter do not engage much in other cross-border business activities beyond arms-length trade.

Most of the companies we contacted could or would not provide quantitative estimates of the changes in costs brought about by the single market programme. Making a quantitative

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[32] European Commission: *The Single Market Review: Results of the Business Survey*, Office for Official Publications of the EC and Kogan Page publishers, forthcoming.

assessment is, in any case, a very complicated task, involving many intractable problems. Many of the single market measures have only recently come into force, so companies have as yet a very limited experience of the new regime, insufficient even to ascertain the direct impact it is having.

The scope of the single market programme is enormous. While as a whole its impact may be substantial, its effects are diffuse and not easy to recognize or disentangle from everything else. The food, drink and tobacco processing machinery industry is very heterogeneous, making a wide range of equipment differentiated along many dimensions (size, function, technology and so on). The impact of regulatory changes on the costs of production varies across equipment types.

If, nevertheless, we are to provide a quantitative indication of the direct cost changes that result from the single market programme, we have to use rough estimates based on very partial information. The results are summarized in Table 4.3. Details on the nature of the cost changes and the calculations underlying the estimates presented in Table 4.3 are provided under 4.2.1, The cost impact of regulatory harmonization, and 4.2.2, The cost impact of horizontal measures.

Table 4.2. Survey evidence on the impact of horizontal single market measures

Percentages of companies reporting positive impacts from:	All	Medium-sized and large[1]	Small[2]
Changes in administrative formalities for cross-border shipments of goods within the EU (customs documentation and VAT declaration), and the elimination of border controls;	61%	57%	75%
Actions to provide a single, EU-wide protection of industrial property rights (patents, trade marks and, in future, utility models and designs);	33%	36%	25%
Measures to promote competition in the provision of road haulage services;	17%	21%	0%
Elimination of restrictions on transfers of capital;	33%	36%	20%
Actions to avoid double taxation (in the country of origin and home country) of earnings or profits repatriated by a subsidiary in another Member State.	28%	43%	0%

[1] Those with 100 employees or more.
[2] Those with fewer 100 employees.
Source: DRI survey of manufacturers.

Table 4.3. The impact of the single market programme on costs in the food, drink and tobacco processing machinery industry: industry totals

	Value of industry-wide cost changes (million ECU)	As percentage of value of industry production in 1993
Regulatory harmonization (sector-specific measures)		
Adjustment to new regulations (one-time cost)	40	0.5
Changes in the level of regulatory requirements	- 85	- 1.0
Harmonization of regulatory requirements	- 20	- 0.2
Changes in conformity assessment procedure	0	0
Total regulatory harmonization (except one-time costs)	*- 105*	*- 1.2*
Horizontal measures		
Elimination of customs formalities and border controls: direct impact[1]	- 25	- 0.3
Elimination of customs formalities and border controls: indirect impact[2]	- 20	- 0.2
Deregulation	- 90	- 1.0
Total horizontal measures	*- 135*	*- 1.5*

[1] Reduction in the delivery cost of food, drink and tobacco processing equipment exported to another Member State.
[2] Impact on the food, drink and tobacco processing machinery industry from the economy-wide reduction of production cost resulting from the reduction of the cost of imported inputs.
Source: See text under point 4.2.

The estimates for the cost impact of regulatory changes are based on information supplied by nine companies, their size ranging from 6 to 300 employees. It largely reflects their experience with the Machinery Directive. It should be noted that, apart from the cost of adjustment and conformity assessment, the cost change estimates mainly relate to the expected impact and not to actual experienced effects. Equipment manufacturers and end-users require time to discern and exploit the cost-saving opportunities presented by the new regulatory regime. Up to the present, very few manufacturers have modified their equipment range in response to regulatory harmonization, so that even what might have been expected to be immediate effects have not yet completely materialized.

Two sets of information were used to derive an indication of the impact of horizontal measures. Hypotheses on the general cost implications of these measures were obtained from older studies. Their specific impact on the food, drink and tobacco processing machinery industry was assessed using an input-output model of the main European economies.

4.2. The direct short-term impact on production costs

4.2.1. The cost impact of regulatory harmonization

Table 4.4 presents a summary of the impact of regulatory harmonization (sector-specific single market measures) on preproduction and production costs in the food, drink and tobacco

processing machinery industry. The cost changes are grouped under four headings: initial adjustment costs, changes in the level of regulatory requirements, harmonization of regulatory requirements (to be distinguished from the effects of changes in the level of regulation) and conformity assessment procedures.

Compliance with the Machinery Directive causes initial one-time research and design costs that relate to the collection of information on EU legislation and its implications for equipment specifications, the instruction of the relevant employees and the redesign of existing equipment. These costs may include the purchase of information on legal requirements and product norms, the hiring of a consultancy to provide information and training and the internal time spent on research and redesign. For a small to medium-sized firm (or for a production unit of a large firm) the costs run to about ECU 15,000–25,000, spread over one or two years. The amount varies depending on the scope of the equipment produced, but in other respects it is independent of firm size. Consequently, the burden is larger for small firms.

Table 4.4. The impact of regulatory harmonization on the production costs in the food, drink and tobacco processing machinery industry

	Type of cost/cost saving	Estimate of cost/cost saving
Adjustment to new regulations	Research and development costs related to the collection and internal dissemination of information on requirements laid down by directives and on corresponding standards; redesign.	15,000–25,000 ECU one-time cost per small to medium-sized plant.
Changes in the level of regulatory requirements	Additional manufacturing cost per machine (in supplementary materials and assembly time) for equipment sold in markets where safety requirements laid down by EU legislation are stronger than those required under previous national regulation. Lower manufacturing cost of equipment sold in markets where EU legislation lays down weaker requirements than previous national regulations.	-5–+5% of machine price, depending on the requirements imposed or removed by EU legislation in comparison with previous national regulation.
Harmonization of safety requirements	Saving in development costs from reduction of variants.	0.2% of annual sales.
Changes in conformity assessment procedure	Administrative cost of conformity assessment (EC declaration of conformity, technical file).	No significant cost.

Source: DRI interviews with manufacturers.

Expressed relative to annual revenues, the initial compliance cost can run from less than 0.1% for medium-sized and large enterprises (sales of ECU 20 million or more) to 1.5% for very small enterprises (sales of ECU 1 million). One very small company reported that the management, research and design time needed to incorporate EU legislation was significantly increased by the absence of European standards and by difficulties in finding guiding principles on how to comply with the essential safety and hygiene requirements laid down by

EU directives.[33] Of the companies responding to the postal survey, about half reported that they had incurred important costs in modifying equipment to comply with the requirements laid down by new directives. Among small companies, this fraction rose to 70%.

Compliance with the requirements laid down by EU directives may also permanently increase manufacturing costs. This occurs when the safety requirements laid down by EU legislation are tougher than those that were in force under national regulations. Constructing machinery in line with the new requirements entails higher costs because of the supplementary or more expensive materials required to do this and the longer assembly time required. These are not adjustment costs, but simply reflect the price of ensuring the safety level commonly agreed to by the Member States and laid down in a directive. The size of the cost change varies depending on the type of equipment and what the requirements in the Member State where it is sold were before. Information from company interviews suggests that, in most cases, no modifications that had a significant permanent cost impact were necessary. In a few instances, cost increases of up to 5% were cited. Equipment producers are generally not concerned about this cost, which is passed on to the end-user, on the condition that the requirements are enforced in all Member States. Some suspect that their competitors in a few Member States do not make the necessary modifications to their equipment and so gain an unfair cost advantage. This suspicion is not confirmed by the results of our survey, which show no significant differences between countries in the percentages of companies reporting that there are important compliance costs.

On the other hand, in markets where the regulations that were in force were tougher than the requirements of EU legislation, complying with EU rules actually reduces the manufacturing costs of the machinery concerned. At present, supplementary parts and extra assembly time to meet the particular workplace safety requirements of a Member State (mostly not explicitly laid down by law, but by de facto binding industry standards) may increase the price of equipment by 5%. Note that cost savings resulting from adopting EU requirements are only realized on the equipment sold in markets where previously more demanding national rules applied, and only then if the customer is prepared to accept EU rules instead of the stronger national ones formerly in force.

In addition to establishing a level of regulatory requirements, single market measures harmonize these requirements across the EU. Both aspects of EU legislation have a distinct impact. The harmonization of machine safety regulations by the single market programme permits a reduction in the number of equipment or component variants offered as the same variant conforms with the harmonized legal requirements in all Member States. This allows savings in development costs, because different equipment models or safety components need not be developed to comply with the particular regulations of a Member State. The survey of manufacturers did not yield quantitative information on how much these amount to, or have the potential to amount to. Companies that commented on the matter expected the impact to be small, due to the fact that equipment in this sector is customized and the scope for standardization very limited.

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[33] The Molitor group also mentions the problems that, in particular, small and medium-sized companies have in identifying the standards applicable for their particular product, but does not develop this in a recommendation. The remark is made in the introduction to Proposal 12, which stresses the importance of ensuring that standards are practical and commercially realistic. (*Report of the group of independent experts on legislative and administrative simplification*, COM(95) 288 final/2, Chapter 2: Machine standards, p.26.)

The administrative costs associated with conformity assessment are low. The new approach directives, which harmonize technical regulations, have established a conformity assessment system common to all Member States and to all areas of equipment regulation. The system is modular, ranging from simple self-certification to unit-testing by an officially approved third party, the level required increasing proportionally with the risk associated with the equipment. As most equipment manufactured by the food, drink and tobacco processing machinery industry is not particularly hazardous, self-certification suffices in almost all cases. Under this system, manufacturers must draw up an EC declaration of conformity for each unit sold and assemble a construction file for each type of equipment sold.[34] The declaration of conformity accompanies the machine and must briefly describe the equipment and the technical means and specifications that have been used that mean it complies with the legal requirements laid down by the relevant directives. The construction file is kept by the manufacturer and contains additional technical details (plans, test results and so on).

Under national regulations certification by the manufacturer was not required for most equipment, so EU legislation imposes an obligation that did not exist before. Nevertheless, most manufacturers did not find it particularly burdensome. Companies already document their products and production process for internal purposes and to provide information to customers. As a result, EU rules neither increase nor decrease conformity assessment costs appreciably.

An assessment of industry-wide cost changes

Combining the above information with several other elements of partial evidence, a rough estimate of the industry-wide impact of regulatory harmonization on costs was derived. The results of these calculations are presented in the top panel of Table 4.3 earlier in this chapter. The objective of this exercise was to provide an order of magnitude of the total impact of sector-specific measures. Precise estimates were impossible given the available data.

In the manufacture of machinery for the food, chemical and related industries (group 324 of NACE 1970) about 2,500 enterprises having 20 or more employees were counted. Data from Member States where also smaller enterprises are counted, suggests that there are another 2,500 firms with fewer than 20 employees.[35] There are also many enterprises without employees. Presumably, they do not manufacture machinery, but supply installation, maintenance and repair services. They were therefore not counted. We assumed that 40% of these enterprises are in the food, drink and tobacco processing machinery industry, in accordance with the share of the production value of this industry in the total for NACE group 324. This yields 2,000 enterprises. Assuming that compliance with the new regulatory regime entails for each firm adjustment costs of ECU 20,000, the industry total amounts to ECU 40 million or about a 0.5% of the value of industry production in 1993.

As we have seen the establishment of common harmonized requirements increases the cost of equipment put into service in Member States where less demanding regulations or standards were previously in force and lowers the cost of equipment destined for Member States that

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34 In sectors such as the food, drink and tobacco processing machinery industry where a large part of the output consists of unit production, this means that a technical file should be provided for each unit sold.

35 Eurostat. The data relate to 1993.

previously had tougher regulations. In the interviews with those in the industry, several cases were reported of equipment being modified to comply with stiffer regulations or standards. Nearly all of these concerned equipment destined for Germany. Based on interview information, we will assume that application of the new regulatory requirements permits manufacturers to reduce the price of equipment destined for the German market by 5%. On German domestic sales of about ECU 2.5 billion, this represents total savings of ECU 125 million.

In the other Member States, the implementation of harmonized regulations is assumed to increase prices by 1%. This is because the safety requirements listed in the Machinery Directive are usually more detailed and extensive than those in national worker safety legislation, so that compliance may require additional safety features, raising the cost of equipment. Domestic sales in the EU outside Germany were worth about ECU 4 billion in 1993, yielding a total cost of ECU 40 million. The net impact of the change in the level of regulation resulting from the single market programme is, then, a cost-saving of ECU 85 million or about 1% of the value of industry production.

The impact of the harmonization of regulation is probably smaller. About 15% of those who responded to the survey reported that they offered several variants on pieces of equipment for solely in order to comply with the regulations of another Member State. A study by European Research Associates and Prognos[36] found that up to a third of a firm's research and development budget may be devoted to adjusting technology to align with different national settings. Research and development expenditures in the food, drink and tobacco processing machinery industry represent about 5% of annual sales. Combining this information yields an estimate for the potential savings in development costs that could result from the harmonization of technical regulations of about 0.2% of industry sales or ECU 20 million.

4.2.2. The cost impact of horizontal measures

Horizontal measures have lowered the intermediate input costs of the food, drink and tobacco processing machinery industry in at least two ways. First, deregulation has prompted lower prices in various sectors, mainly services. Second, the elimination of border controls and customs formalities has reduced the costs of imported inputs.

EU initiatives have successfully put into motion and promoted the deregulation of various sectors, notably transport services, telecommunication services and steel. Competition and efficiency in these sectors have increased, leading to lower prices for users and consumers. The weight of these goods and services as factors in the prices of food, drink and tobacco processing machinery is not that great. The cost of steel inputs represents about 7% of the value of equipment, while transport and telecommunication services each make up less than 1% of it.[37] Viewed from a wider perspective, however, the impact of deregulation can be seen to be greater. The lower prices of deregulated goods and services reduce costs for all sectors in the economy, ultimately leading to lower prices for all goods and services. The food, drink,

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[36] European Research Associates and Prognos, 'The cost of non-Europe: Obstacles to trans-border business activity', in European Commission, *Research on the 'Cost of non-Europe': Basic findings*, Vol. 7, Office for Official Publications of the European Communities, 1988.

[37] *Source:* National statistics, actually relating to the manufacture of machinery for the food, chemical and related industries (group 324 of NACE 1970).

and tobacco processing machinery sector therefore benefits not only when it purchases deregulated goods and services, but in all its intermediate inputs (for instance, metal products, which themselves are more directly affected by steel prices).

Computing the full impact of deregulation must involve using an input–output framework, which takes into the account the intermediate supply relationships between sectors. Two scenarios were investigated using a sectoral model with an input–output structure and making different assumptions about the effects of deregulation on the prices of the deregulated goods and services. The results of these are given in Table 4.5. Due to the lack of more recent information, base data were taken from a study conducted by the Directorate-General for Economic and Financial Affairs in 1987, which constructed an overall assessment of the potential effects of completing the single market, assembling and integrating information from 'The cost of non-Europe' studies.[38]

The sectoral model used only covers the four largest European economies, which are Germany, France, the UK and Italy, and provides sectoral detail at the level of the mechanical engineering sector as a whole. The fact that only these countries were covered is not very problematic as they account for more than 80% of the production of food, drink and tobacco processing machinery in the EU and only the Netherlands is left out. The figures used, therefore, can yield reasonable indications as to the cost impact if the input structure of the food, drink and tobacco processing machinery industry is similar to that of mechanical engineering as a whole. Partial information available on the manufacture of machinery for the food, chemical and related industries would indicate that this is the case.

Table 4.5. Assumptions on the impact of deregulation on prices

Sector	Assumed impact of deregulation on prices in sector (%)	
	Low	High
Energy	0	-5
Iron and steel	-5	-5
Transport services	-5	-10
Telecommunications services	-5	-10
Financial services	0	-5
Business services	0	-3

Subject to these caveats, the model proposes that the impact will be a 1% reduction in the prices of machinery following deregulation when it is assumed that it will have a low impact and a 2.2% drop when it is assumed that it will have a high impact on prices.

The elimination of customs controls has an economy-wide impact on the prices of imported intermediate inputs, leading, as with deregulation, to price reductions in all sectors. The model

[38] European Commission. 'The economics of 1992', *European Economy*, No 35, March 1988.

we used does not distinguish between imported and domestic inputs. However, it does differentiate import prices, so that the average price of a good is determined by the price of domestic production and of imports. In the model, the elimination of customs controls is assumed to result in a reduction of import and export prices. Again, two scenarios were considered, loosely based on the assumptions used in the abovementioned study by the Directorate-General for Economic and Financial Affairs. Trade prices were assumed to fall by 1.6% in the low impact scenario and by 1.9% in the high impact scenario. This yielded a reduction in the price of machinery of about 0.2% in both cases.

Finally, the elimination of customs controls has a direct impact on the costs of cross-border exports of food, drink and tobacco processing machinery. Of the total consumption of food, drink and tobacco processing machinery in the EU, 22% consists of intra-EU imports. A cost reduction of 1.6 to 1.9% on these sales represents savings of almost 0.3% of the value of production or about ECU 25 million. These estimates are also presented in Table 4.3.

4.3. The development of cross-border sales and marketing

4.3.1. The expected impact of the single market programme

The removal of barriers to cross-border sales of food, drink and tobacco processing machinery within the EU, as a result of sector-specific and horizontal measures, is expected to increase intra-EU trade in this type of equipment. It might also induce higher imports from outside the EU.

The removal of administrative and regulatory obstacles to cross-border sales of machinery within the EU makes it easier for industrial equipment manufacturers to export their machines to other Member States. In this way, manufacturers are able to sell equipment in which they have competitive advantage to a larger market. This process results in greater specialization among manufacturers within the EU and an increased level of intra-EU trade relative to the level of production and consumption. In other words, if the completion of the single market has facilitated the cross-border movement of machinery within the EU, this will be visible in a higher intra-EU import penetration and export intensity and an increase in the proportion of intra-EU trade in the trade of these items as a whole.

The measures taken to harmonize technical regulations between Member States are not discriminatory and also benefit companies from non-EU countries that export to the EU. Just as their rivals based within the EU find, they are able to sell their equipment in a larger, unified market. The elimination of customs formalities, however, only applies to internal borders. This said, customs formalities at frontiers external to the EU have been substantially simplified in recent years. The completion of the single market, therefore, may mean that extra-EU imports increase.

Although this is so, the effects of the completion of the single market on the trade in food, drink and tobacco processing machinery industry are likely to be relatively small. In most segments of the industry, trade barriers were already low. While the level of trade in the industry is below average, particularly when compared to the rest of mechanical engineering, this can be explained by structural factors. The demand for customized equipment and the importance of after-sales servicing require proximity to the customer and limit the potential for economies of scale. This suggests that single market measures will allow companies to

achieve some reduction in production costs (as discussed above), but will not substantially alter the intensity of trade.

No significant impact should be expected before 1992 as the important measures did not come into effect before then. Harmonization of technical regulations was mainly achieved by the Machinery Directive. This Directive was adopted in 1989, came into force in 1993 and became fully effective only in 1995, after its transition period expired. Other directives were implemented earlier (for example, the Low-voltage Equipment Directive in 1974 and the Simple Pressure Vessels Directive in 1990), but their relevance to food processing machinery is minor. Customs formalities were abolished from 1 January 1993, although the procedure was already simplified in 1988 by the introduction of the Single Administrative Document. This means that any effect before 1992 must stem from the few minor measures that were already in effect or were put in place in anticipation of the effective implementation of the measures listed in the 1985 White Paper.

Unfortunately, the trade data may be plagued by statistical problems after 1992 because then it was that the INTRASTAT data collection system replaced the abolished customs declaration. The observations of intra-EU trade register a sudden, unprecedented drop in 1993, which might be due to reporting problems rather than an actual drop. More observations are needed to determine whether or not there has been a break in the series.[39] In the meantime, no reliable yardstick is available with which to measure the impact of the single market after 1992, which is when the most important measures were implemented and some significant, visible effects could have been expected to occur.

4.3.2. The impact of other sectoral developments

Various other developments not related to the removal of trade barriers have also affected the trade in food, drink and tobacco processing machinery in the last decade, particularly the ratio of intra-EU to extra-EU trade.

One of these is the competitiveness of EU manufacturers. The last 15 years have seen dramatic swings up and down in the price competitiveness of EU manufacturers in world markets due to substantial exchange rate fluctuations. The rate for the US dollar is especially important to this effect. Dollar zone markets – notably the US and Asia – absorb more than half of the extra-EU exports of food processing equipment. Furthermore, Europe and the US are the leading producers of food, drink, and tobacco processing equipment, and American companies are the main competitors in world markets. Between 1980 and 1985, the value of the dollar rose 80%, improving EU competitiveness commensurately. This should have given a boost to extra-EU exports. In the following two years, however, the reverse occurred – the dollar dropped back almost to its 1980 level (see Figure 4.1).

A second factor affecting trade is demand. The period 1987 to 1991 witnessed strongly growing investment activity in the EU's food, drink and tobacco processing industries. At the

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[39] In addition, the export data for 1993 and 1994 contain large observations with unknown extra-EU destination.

Figure 4.1. ECU per US dollar from 1980 to 1994

same time, food industry investments in the US – the largest single export market – were stagnant and also, from the point of view of an EU exporter, depressed, due to the low value of the dollar (see Figure 4.2). This should have resulted in a strong domestic demand for equipment in the EU, diverting exports away from non-EU markets and increasing the ratio of intra-EU to extra-EU trade.

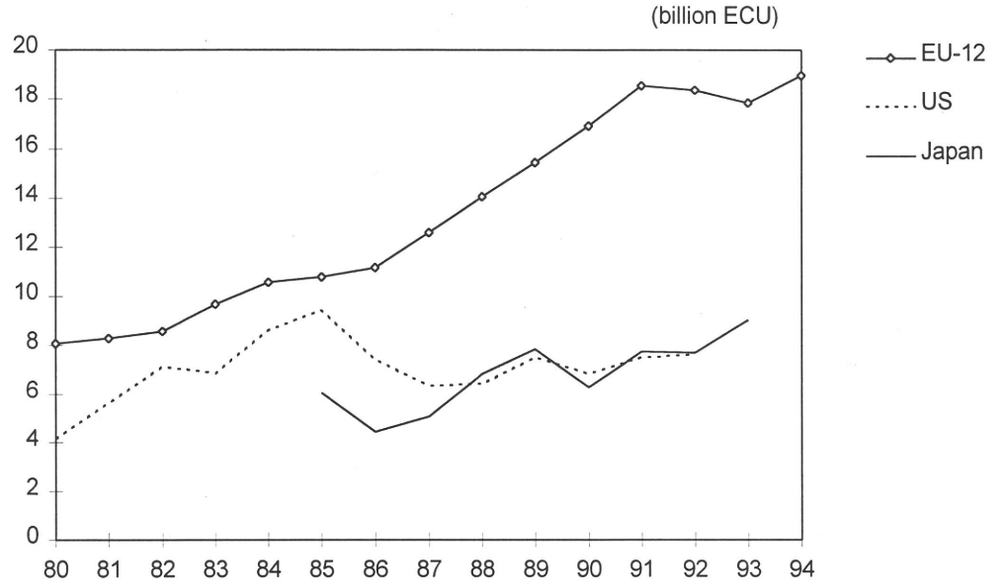
The investment activity in the EU food, drink and tobacco industry was not an isolated development, but, rather, part of an EU-wide investment boom in the manufacturing sector. When the evolution of investment by the food, drink and tobacco industries and by the manufacturing sector as a whole are put on to a graph, the patterns match very closely (see Figure 4.3). Furthermore, a similar pattern is visible in the domestic sales of machinery for the food, chemical and related industries, illustrating the relationship between investment and the demand for equipment.

4.3.3. The evidence

The survey findings point to a small increase of marketing activities in other Member States. Compared with 1985, those who responded to the survey have slightly increased the number of EU Member States in which they sell their equipment: from 10 to 11 for the medium-sized and large enterprises (those with 100 employees or more), and from 5 to 6 for the small companies (those with fewer than 100 employees). Also, 22% of those who took part reported that they had increased their advertising efforts in other EU countries in response to the improvement in market access.

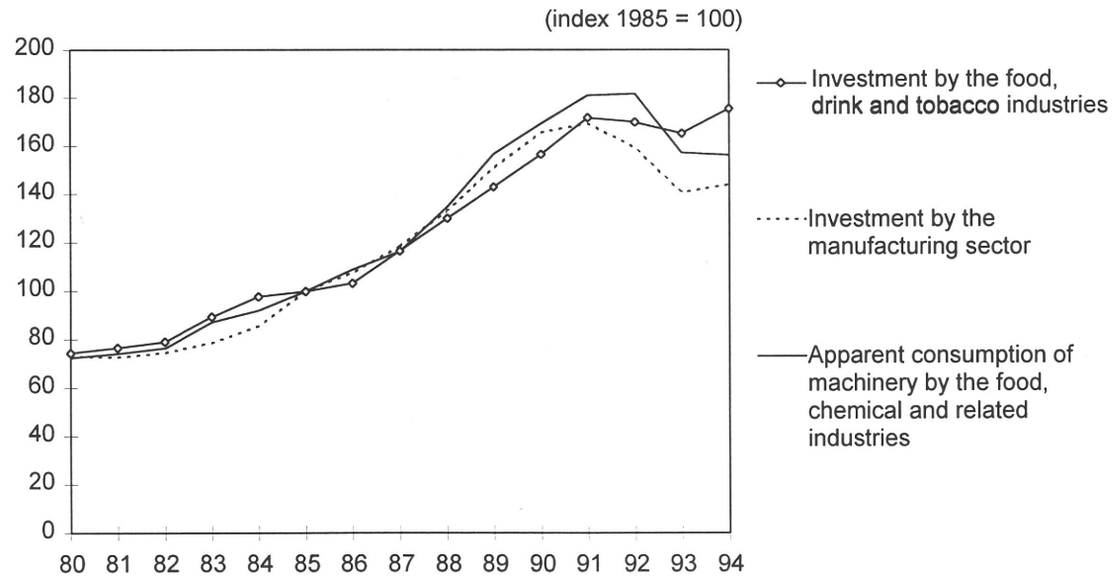
Trade statistics, on the other hand, show no conclusive evidence of the single market measures having an impact. Unfortunately, due to the unavailability of consistent data on the production and sales of food, drink and tobacco processing machines over time and across countries, it is impossible to examine the evolution of import penetration and export intensity over time.

Figure 4.2. The food, drink and tobacco industry's investments in current prices in the EU, the US and Japan from 1980 to 1994



Source: DEBA.

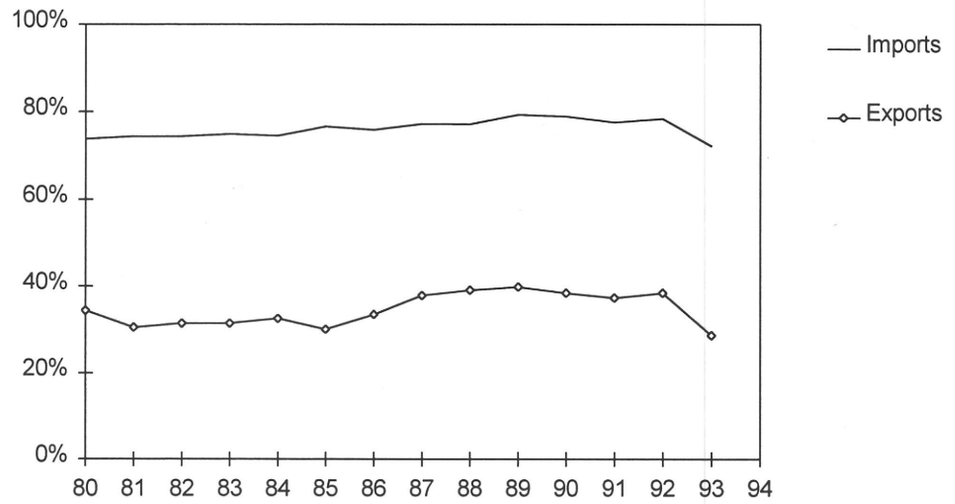
Figure 4.3. The relationship of investment to demand for equipment from 1980 to 1994



Source: DEBA.

Consequently, we can only look at the share intra-EU trade has of the total trade. This is an ambiguous measure, to the extent that single market measures are non-discriminatory and so facilitate imports from non-EU countries as well as from other Member States, meaning that the ratio of intra- to extra-EU imports may not change by much.

Figure 4.4. The share intra-EU[1] imports and exports have of total imports and exports[2] of food, drink and tobacco processing machinery



1 Trade with the 12 Member States of the EU for all years.
2 Trade by the 9 Member States of the EU in 1980, the 10 Member States in 1981–83 and the 12 Member States from 1984.
Source: Eurostat.

The share intra-EU imports and exports have of total imports and exports of food, drink and tobacco processing machinery are shown in Figure 4.4. On the import side, the share of intra-EU trade rose steadily from 74% in 1980 to 79% in 1989. It then remained about constant until 1993, when it dropped to 72%, below its level in 1980. However, as already mentioned, the observation for that year may be unreliable. The slow increase in the share of intra-EU imports before 1989 cannot be related to any single market measure, while in the late 1980s, when the single market programme had been launched, albeit not yet implemented, no impact is visible.

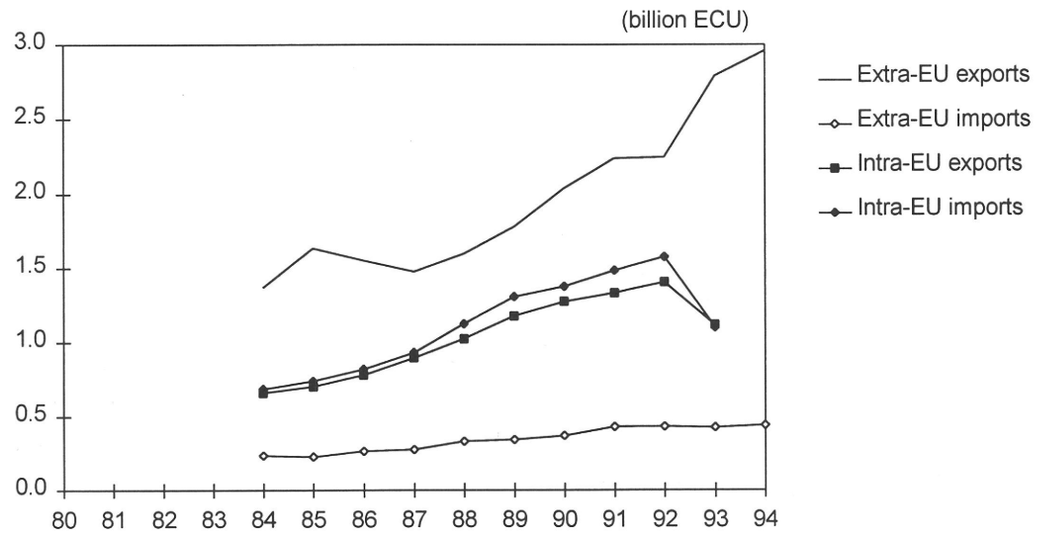
On the export side, more dramatic developments occurred. Between 1985 and 1987, the share intra-EU exports had of total exports rose from 30 to almost 40%. A look at the absolute export values reveals, however, that this was due to a drop in extra-EU exports, not to an expansion of intra-EU exports (see Figure 4.5). The obvious explanation for the rise is the sharp depreciation of the dollar – which fell by 35% against the ECU in the same period – and the resulting deterioration in the competitiveness of EU Member States.

For the broader industry definition relating to machinery for the food, chemical and related industries, data on production and consumption over time are available, so developments in trade intensity here can be investigated. The results are presented in Figures 4.6 to 4.8. Again, there is no strong evidence that the single market had a significant impact.

Import penetration increased considerably between 1980 and 1987, rising from 35 to 45%. After 1987, the degree of import penetration stabilized. Intra-EU and extra-EU imports

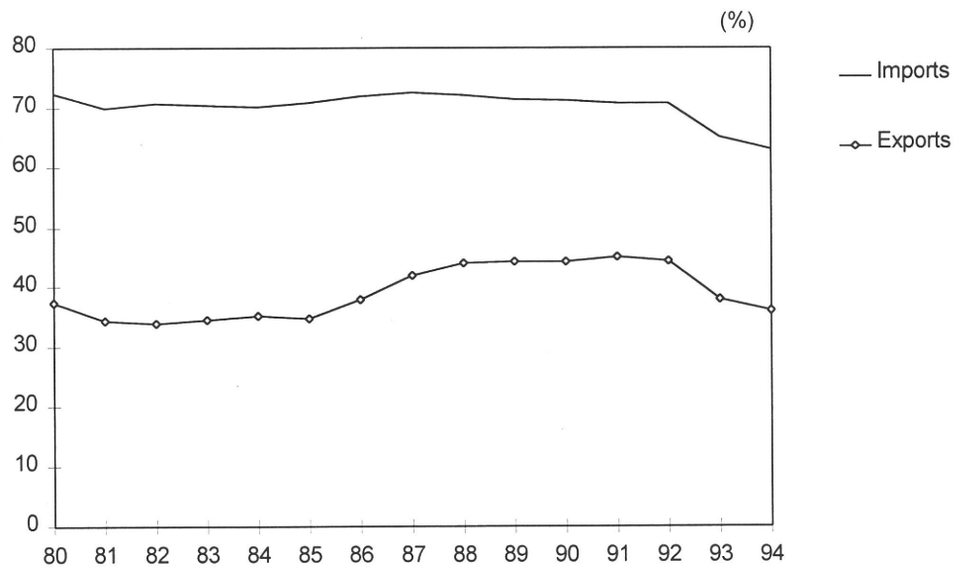
behaved almost identically until 1993 , the share intra-EU imports had of total imports staying virtually the same. In 1993 and 1994, the penetration of extra-EU imports rose and that of intra-EU imports actually declined, which is contrary to what was expected as a result of the introduction of single market measures.

Figure 4.5. The EU's imports and exports of food, drink and tobacco processing machinery



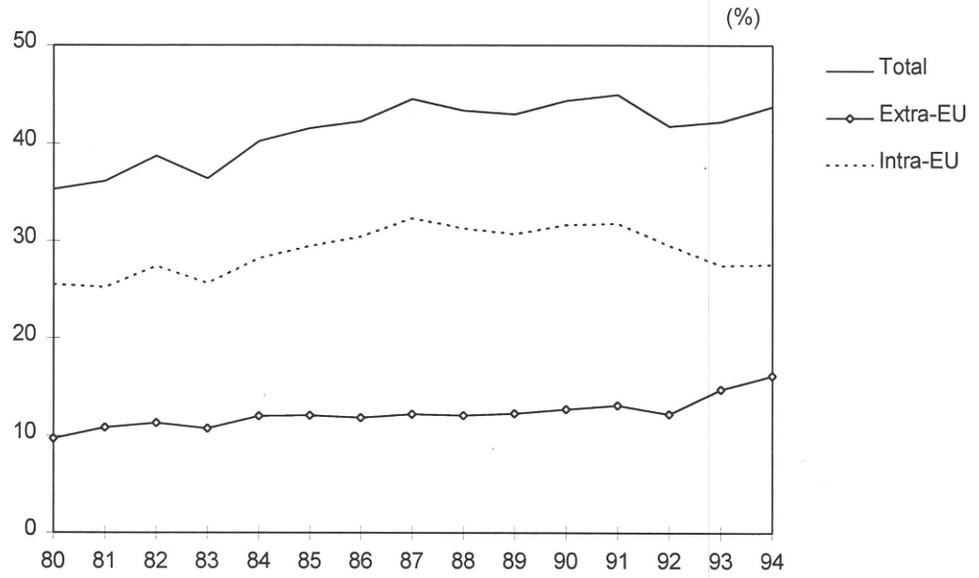
Source: Eurostat.

Figure 4.6. The food, chemical and related machinery (NACE group 324) industry's share of intra-EU trade



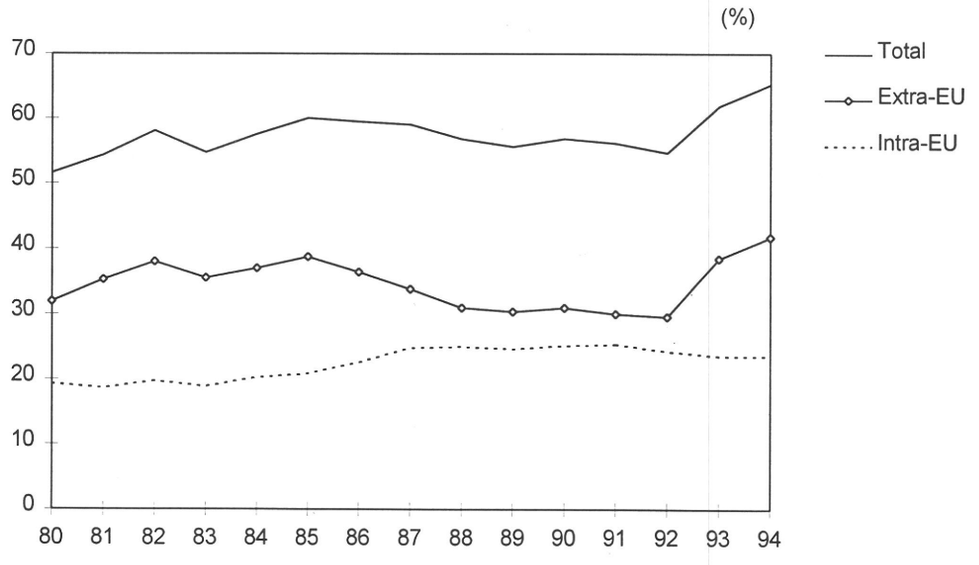
Source: Eurostat.

Figure 4.7. The import penetration (share of imports in apparent consumption) of the food, chemical and related machinery (NACE group 324) industry



Source: Eurostat.

Figure 4.8. The export intensity (share of exports in value of production) of the food, chemical and related machinery (NACE group 324) industry



Source: Eurostat.

Most of the growth in extra-EU imports originated from the US, while the share of the market nearby European suppliers had shrunk. However, it is difficult to draw conclusions from this evidence until it is clear whether or not the observations for 1993 and 1994 are reliable.

Up to 1992, the total export intensity of machinery for the food, chemical and related machinery industry was relatively stable at around 55 to 60%. The composition of exports,

however, changed substantially in the period 1985–88. Extra-EU exports fell from 40 to 30% of production, while intra-EU exports rose from 20 to 25% of production. This pattern is in agreement with a diversion of exports from non-EU to EU destinations as a result of a loss of competitiveness in non-EU markets on one hand and an increasing demand for equipment in the EU on the other.

In 1993 and 1994, extra-EU exports jumped up again to more than 40% of production, while intra-EU exports stagnated. That this happened in 1993 could be explained by the recession in the EU. Investment demand slumped, driving manufacturers to international markets in search of outlets for their products. Exports to Eastern Europe seem to have increased in particular, but to draw conclusions is difficult because the data in 1993 and 1994 also contain large observations for extra-EU exports with unknown destination.

4.4. The scale and scope of the effects of changes

4.4.1. The expected impacts of the single market programme

The single market programme enables the realization of economies of scale in at least two distinct ways.

One is a short-term direct effect and is one that has already been discussed under 4.2. The harmonization of technical regulations at the level of the EU immediately removes the need to produce several versions of the same equipment to meet different national regulations. The number of models that need to be produced is reduced, allowing the manufacturer to benefit from the savings that can be made by having longer production runs of any one model. As more units of the same model are manufactured, the development and production set-up costs per unit are reduced. Simplification of the equipment range may also increase efficiency and reduce costs in machining and assembly of the products. The estimates of the potential savings in costs that could be made, as shown under 4.2, turned out fairly small, however. As we saw, the principal reason for this is differentiated customer demand, which limits the scope for standardization. Furthermore, inertia among national regulators, customers and equipment producers has delayed the impact of harmonization. Very few manufacturers have so far standardized their equipment ranges according to the new regulations and there is little or no experience of any benefits this move would have. Finally, the industry segment where most regulatory barriers were reported – pressure equipment – is not yet covered by harmonized legislation.

A second way in which market integration enables the realization of economies of scale comes into effect in the longer term and follows on from specialization. The removal of administrative and regulatory obstacles to cross-border sales of machinery within the EU makes it easier for industrial equipment manufacturers to export their machines to other Member States. In this way, they are then able to sell their equipment, in which they have a competitive advantage, to a larger market. This process results in greater specialization among manufacturers, as they then each produce larger quantities of a narrower product range. Furthermore, some marginal producers may not survive in the integrated market and their market share can be taken over by the remaining firms.

A similar specialization and rationalization of production can be implemented within a multinational enterprise. If trade barriers are reduced, multinational producers may find it economical to switch from market-based to product-based subsidiaries and pursue a strategy

of product and process specialization in combination with intra-group trading. The production of a particular type of equipment or component then becomes concentrated in one or more plants, the output of which is supplied to the entire EU.

Note that specialization of production need not increase optimal plant size. Economies of scale in the manufacture of food, drink and tobacco processing machinery mainly relate to production runs for a given model. They can be exploited by standardizing models and swapping production volumes without increasing the overall size of a production run. Manufacturing such equipment remains very labour-intensive with limited scope for automation and, hence, only small economies of scale in production at the plant level can be made.

The potential for specialization and centralization is again limited by the extensive differentiation customers demand. The fact that the intensity of intra-EU trade has not significantly increased in recent years suggests that no substantial specialization and rationalization of production has taken place yet. Specialization among independent firms as well as within multinational enterprises should lead to increased trade.

4.4.2. Other developments

Economies of scope do exist when supplying large and multinational customers. Large food processing firms increasingly centralize their buying departments and look for suppliers that can deliver a wide range of equipment and entire production lines anywhere in the world. To meet these requirements, the leading equipment suppliers have engaged in a strategy of horizontal integration, expanding their geographical and product scope by means of a large number of acquisitions in the second half of the 1980s and the early 1990s. Usually, the targets were successful medium-sized companies with highly regarded technology and trade marks that would complement the technological capabilities and market access of the acquiring company. More details on the merger activity of the leading food, drink and tobacco processing machinery manufacturers can be found under 2.4.3.

4.4.3. The evidence

While the wish to extend geographical and product scope were at the root of the expansion of the last decade, the large manufacturers are now moving towards a greater integration of their operations in order to improve efficiency and realize economies of scale. In a restructuring programme started this year, APV has divided its operations into three divisions. The Product Division manufactures components, and here economies of scale can be achieved. The Engineering Division offers clients custom-tailored equipment and plants, utilizing, wherever possible, components supplied by the Products Division. Finally, the Specialist Division is comprised of stand-alone businesses that serve niche markets by making specialized machinery. The strategic objective of APV is to exploit the synergy between the Product and Engineering Divisions in order that the former pursues increased volume and economies of scale and the latter aims for improved productivity in engineering and design using standardized components as building blocks.

It should be noted that APV's strategy is not an explicit response to the single market, but, rather, stemmed from the need to improve unsatisfactory profit margins. Moreover, it is not limited to Europe, but implemented on a global – or at least transatlantic – scale. While an international integration of production facilities obviously is only possible when trade barriers

are sufficiently low, some small obstacles can be easily overcome. For instance, APV manufactures heat exchangers in Denmark and the US. Both plants are ISO and ASME (American Society of Mechanical Engineers) approved. This provides the company with the flexibility to source products suitable for European and American markets from either the US or Danish plant.[40]

The available statistical evidence does not point to an increase in firm size and, indeed such a move is not necessarily expected to result from market integration. Economies of scale in production are mainly related to batch sizes and production runs of models and are small at the plant and firm level.

Figures 4.9 to 4.11 describe the evolution of some measures of firm size. They relate to the manufacture of machinery for the food, chemical and related industries, as no data on food, drink and tobacco processing machinery alone are available. In all countries, the data refer to the number of enterprises with 20 or more employees, except in the UK where data from 1986 onwards refer to businesses (that is, distinct activities within an enterprise) with 20 or more employees, and in Greece, Spain and Portugal, where data reflect the number of establishments. Overall, the figures suggest a stable industry structure throughout the 1980s and the early 1990s. This is not surprising as there have been no structural factors changing the optimal plant size.[41]

In all Member States, with the exception of the UK and Portugal, the average number of employees per firm remained stable, with a very slight tendency to decrease throughout the period 1980-92 (see Figure 4.9). In Portugal, the development of average firm size is erratic without a clear trend. This is due to the very small size of the industry, so that the survey results display more variation. In the UK, average firm size shows a downward trend, which probably owes to the fact that project contractors (who engineer and build plants, but do not manufacture machinery) are here included in the sector, and their importance increases over time.

The average sizes of firms still differ in different countries. The average number of employees per firm is about 170 in Germany, 100 in France, Italy and the Netherlands, 80 in Belgium/Luxembourg (BLEU), Denmark and Portugal, and about 25 in Spain and Greece. The low number for the last two countries is a consequence of the different survey units they use – all establishments instead of enterprises with 20 employees or more are counted. The reason the average size of firms in Germany and the UK is substantially greater than in other Member States is not that all companies in these countries are, on average, larger, but that these two countries are home to more of the very large firms.

When measured by real production per firm, average firm size likewise appears static, with fluctuations but no clear upward or downward trend (see Figure 4.10). The only exception is Denmark, where firm size increases in the early 1990s. Again, differences in average firm size across countries persist.

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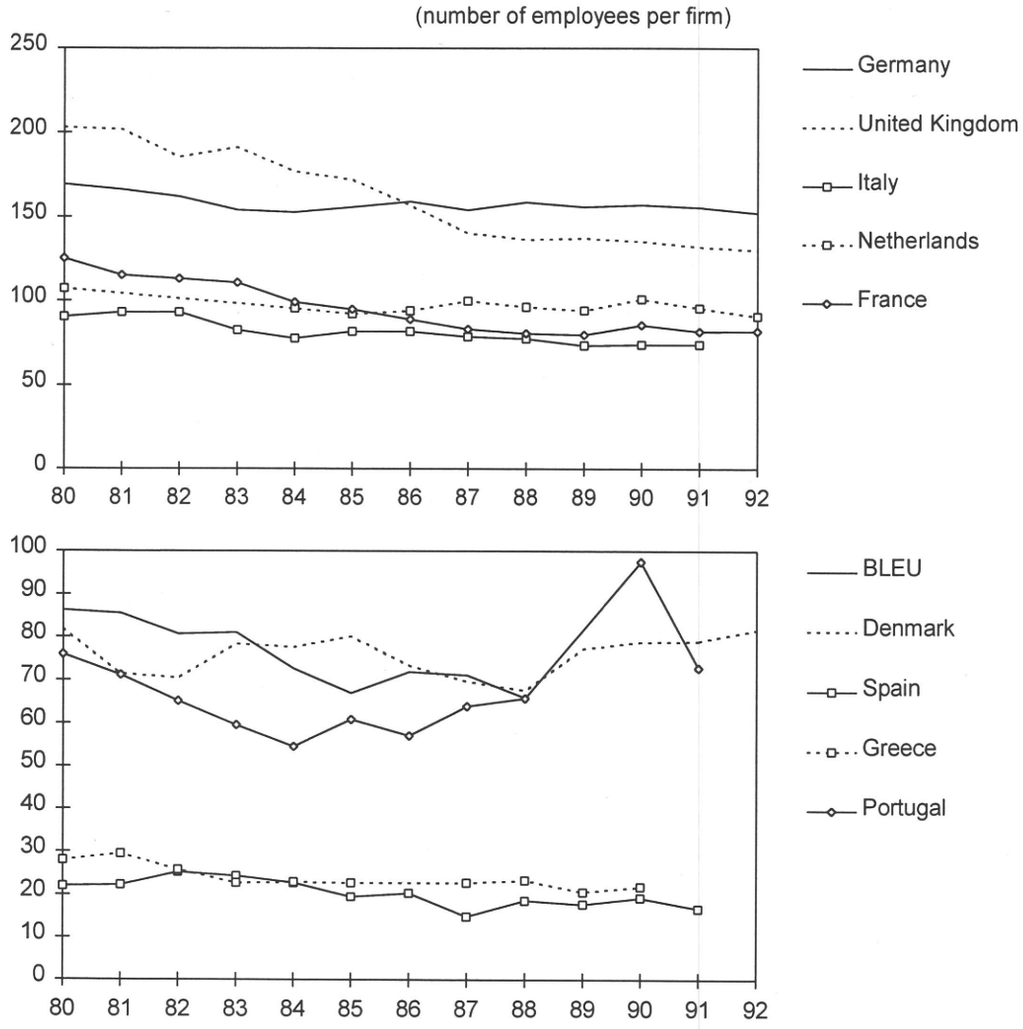
40 APV's annual report.

41 With the exception of Spain, Greece and Portugal, the data presented in Figures 4.6 to 4.8 do not relate to establishments but to firms with 20 employees or more. However, cross-border mergers and acquisitions will not change the number of firms. In most cases, the acquired firm maintains an independent incorporated status and will still be counted for statistical purposes as a firm even after it has become a subsidiary of a larger group.

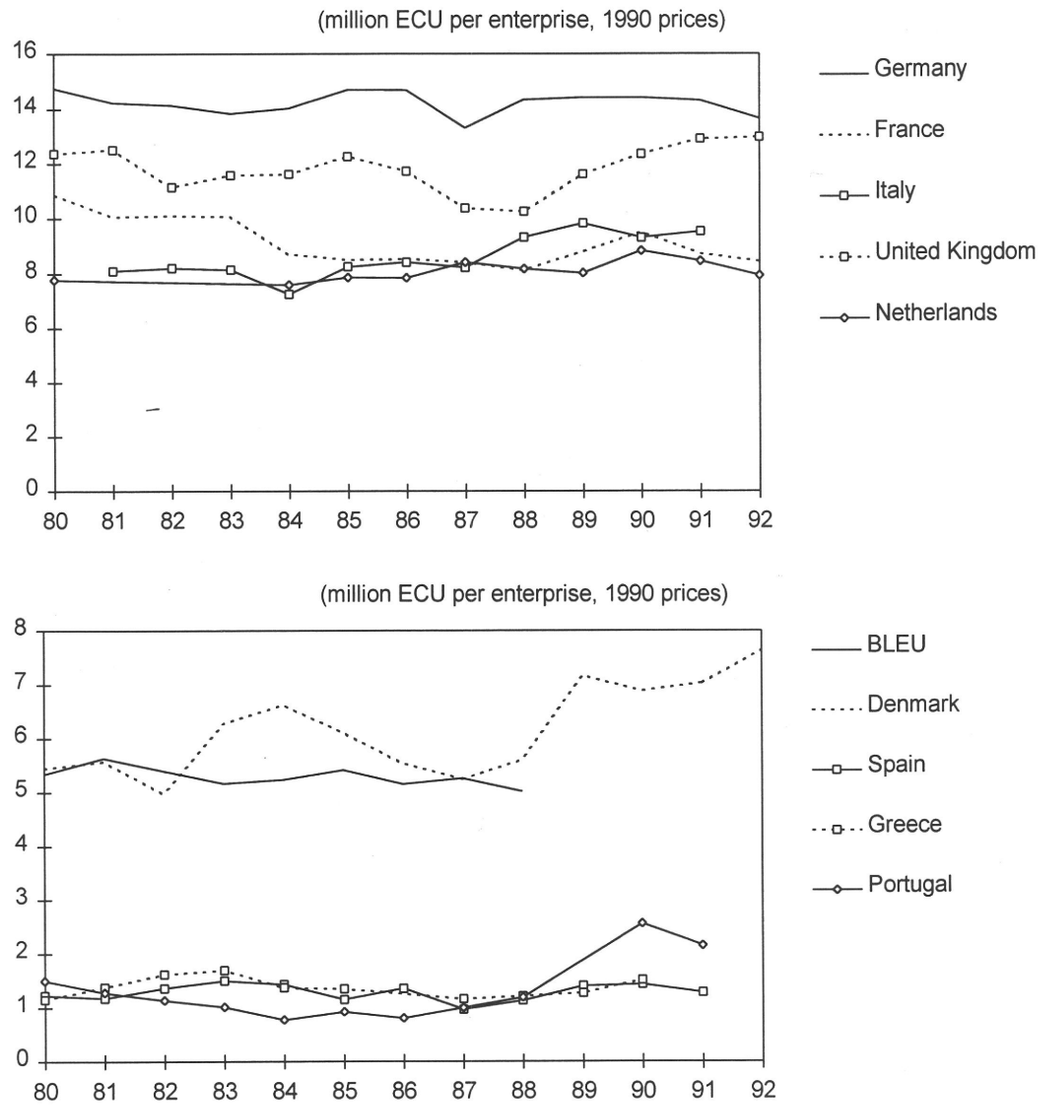
Figure 4.9. Average firm size (average number of employees per firm)[1] in the food, chemical and related machinery manufacturing industries from 1980 to 1992



[1] Enterprises with 20 or more employees, except in the UK from 1986 onwards (businesses or enterprise activities with 20 or more employees) and in Greece, Spain and Portugal (establishments).

Source: Eurostat.

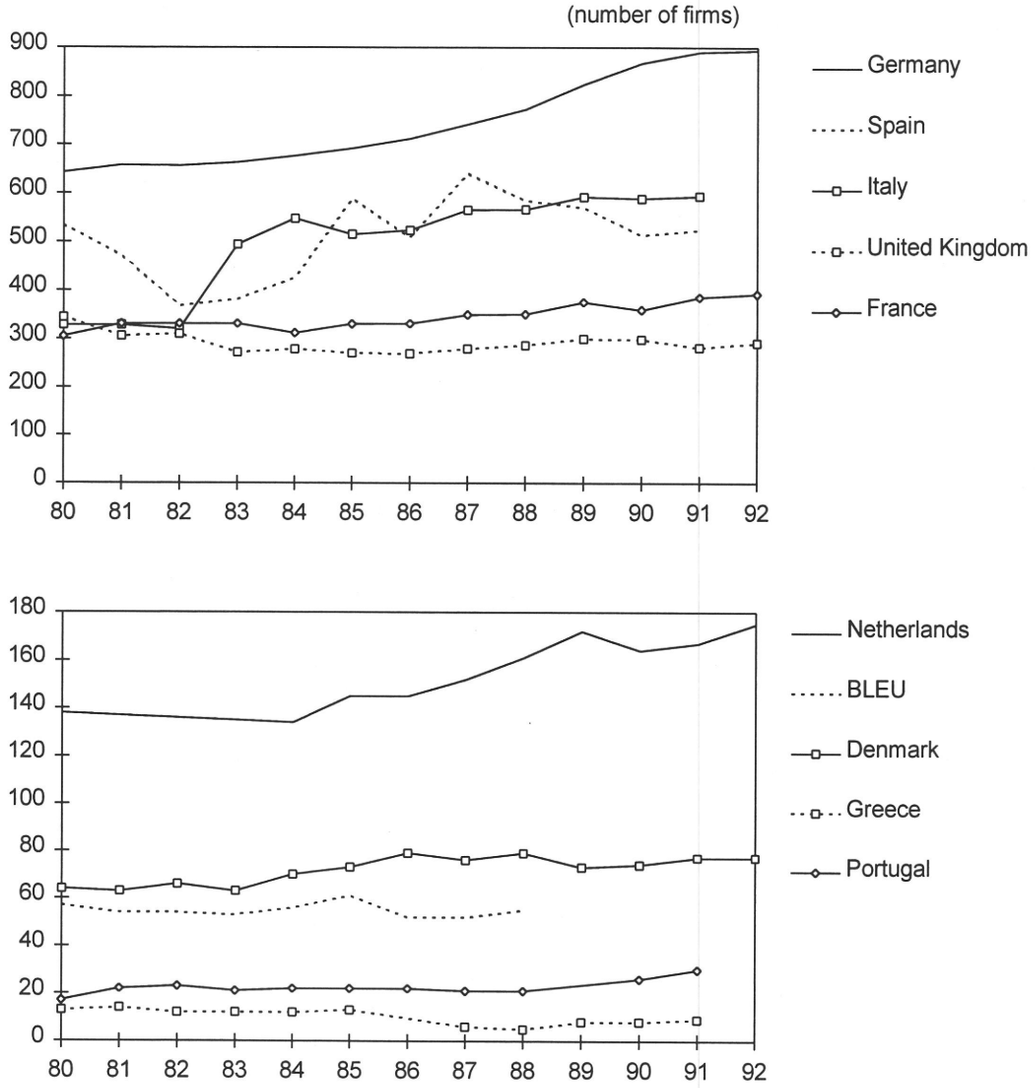
Figure 4.10. Average firm size (average output per firm)[1] in the food, chemical and related machinery manufacturing industries from 1980 to 1992



[1] Enterprises with 20 or more employees, except in the UK (businesses or enterprise activities with 20 or more employees) and Greece, Spain and Portugal (establishments).

Source: Eurostat.

Figure 4.11. Number of firms[1] in the food, chemical and related machinery manufacturing industries from 1980 to 1992



[1] Enterprises with 20 or more employees, except in the UK (businesses or enterprise activities with 20 or more employees) and Greece, Spain and Portugal (establishments).

Source: Eurostat.

In most countries, the number of enterprises has not fallen, and it has even increased in some, for instance in Germany, the Netherlands and Denmark (see Figure 4.11). In combination with the constant evolution of average firm size, this is evidence that there has been no massive disappearance of small firms from the sector, at least not of firms with 20 employees or more.

4.5. The effects on foreign direct investment and location

The single market programme did not affect foreign investment or location decisions of companies in the food, drink and tobacco processing machinery industry.

The industry is almost entirely located in Europe and North America. Within the EU, the bulk of the sector remains located in Germany, Italy, France the Netherlands, the UK and Denmark. No leading company has significant production operations in other Member States, nor plans to develop them. The rest of the world is supplied by means of very extensive sales and service organizations. The large companies typically operate sales and service centres in over 100 countries.

In the last decade, the industry has witnessed substantial foreign direct investments by the leading companies. All these operations involved the acquisition of existing enterprises. The objective was to extend the geographical and product scope in order better to serve large multinational customers (see also 2.4.3 and 4.4.2 for more details on the acquisition activities of leading companies in the food, drink and tobacco processing machinery industry and the background to these).

APV has taken a first step towards transnational investment by opening a plant in China in 1994. In addition, it is building up local engineering capacity in Asia to reduce dependence on skills from Europe. Investments in production capacity in Asia – the fastest growing market for food, drink and tobacco processing machinery – will probably increase in the future. At present, however, direct investments by EU companies in production facilities in Asia or other developing regions are still very small. On the other hand, they all have invested in wholly owned distribution and service networks covering the world.

4.6. Sourcing patterns

Just as the removal of trade barriers has facilitated the cross-border commercialization of equipment, it has also removed administrative or regulatory obstacles to the sourcing of materials and components from other Member States.

Half of the medium-sized and large companies responding to the survey reported that they had increased component purchasing from other Member States in response to the improved access to other EU markets. Of all the actions that companies could indicate as being a response to the integration of the single market (such as the establishment of production units or distribution networks in other Member States, increased exports to other EU countries, an acquisition or alliance), this was the one that was cited most often.

Findings from the interviews with those in the industry suggested that the abolition of customs formalities and border controls played the most important role in promoting sourcing from other Member States. Delays at borders discouraged companies from importing components because it increased transport costs and created problems for inventory and production planning.

In contrast, not a single small enterprise said that they had increased the number of purchases they made from other Member States. Also, not a single company, large or small, reported to have increased their sourcing of business or financial services from other EU countries.

4.7. Changes in competition and market concentration

The single market programme is not expected significantly to alter the degree of competition in the food, drink and tobacco processing machinery industry, for the same reason that it is not expected to have a major impact on trade. In most segments of the industry, barriers to trade

were already relatively low and did not provide a shield against rivals from other Member States. For at least the large manufacturers, the further integration of the single market has not changed the relevant market, which has always been the world.

The level of concentration has undoubtedly increased in the last ten years, as is clear from the large number of mergers and acquisitions that the leading operators have undertaken since the mid 1980s (see 2.4.3 for a description of acquisition activity in the industry). As we saw earlier, the objective of the acquisitions was the expansion of the geographical and product scope in order better to meet the comprehensive needs of large food processing groups.

How much concentration has increased is impossible to say. Because of the wide geographical and product scope of the large firms in the food, drink and tobacco processing machinery industry, calculating market shares is difficult and requires concentration. However, it is clear that even after the wave of acquisitions that has occurred, the level of concentration in the market is still small. The largest companies probably do not hold much more than 5% each of the EU market.

At the other side of the spectrum, hundreds of small firms maintain their places in the industry, making specialized components or serving small local markets. Figure 4.11 above proves that the number of firms (at least those with 20 or more employees) does not show any sign of falling.

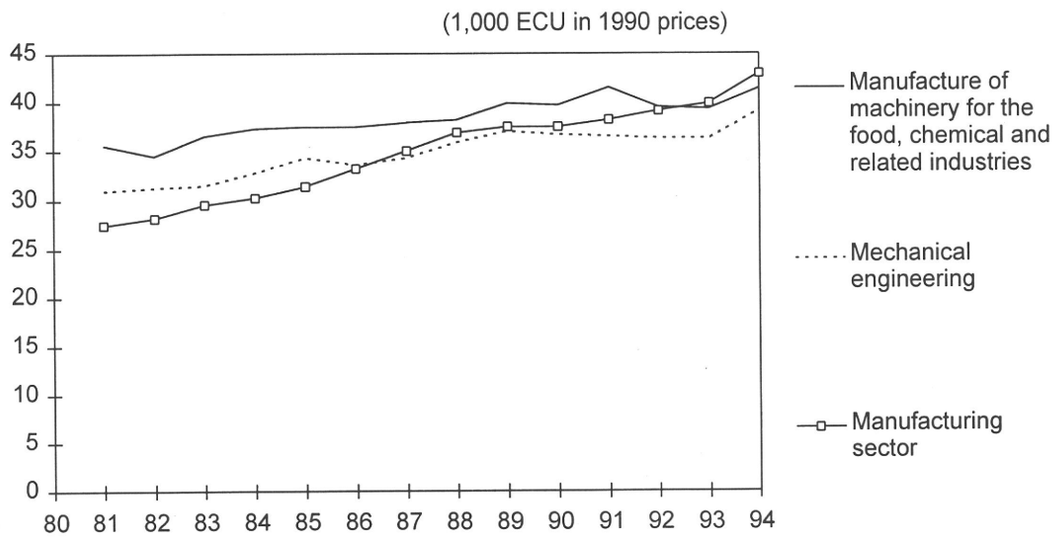
4.8. Productivity

The integration of the single market impacts productivity by means of various indirect mechanisms. The increase in competitive pressure following the removal of barriers to trade forces companies to eliminate inefficiency, which translates into indirect productivity gains. The fuller exploitation of economies of scale permitted by the creation of a larger integrated market may also lead to significant improvement in productivity.

Having said this, as we have seen the scope for productivity gains in the food, drink and tobacco processing machinery industry as a result of the single market programme is limited. It was concluded earlier that as barriers to trade in the industry were already relatively low, single market integration is not expected to have a significant impact on the level of competition. The potential for the exploitation of economies of scale is constrained by the differentiation of customer demand. Moreover, the potential that is present did not have time to materialize as most measures aimed at regulatory harmonization have only recently come into force. It is therefore not surprising that when we look at the aggregate statistics of labour productivity in the manufacture of machinery for the food, chemical and related industries, there is no sign of the single market having had an impact.

Apart from the recession years of 1982 and 1992–93, real value added per employee increases steadily. The rate of growth is about the same as in mechanical engineering as whole, but significantly lower than the average for the manufacturing sector (see Figure 4.12). That this is so is because of the high labour intensity of machine construction and the limited scope for automation.

Figure 4.12. Real labour productivity (value added per employee in constant prices) in the food, chemical and related machinery manufacturing industries from 1980 to 1994



Source: DEBA.

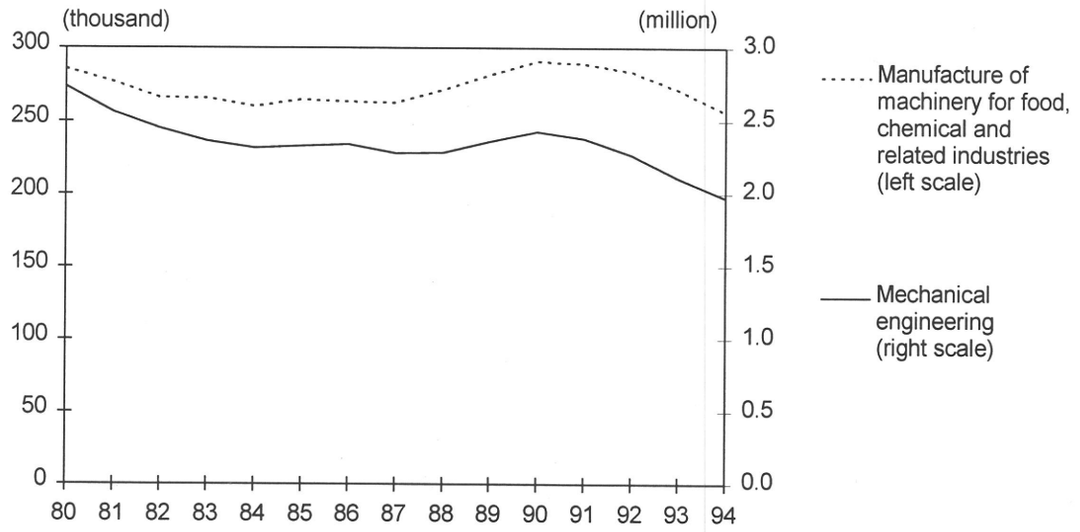
4.9. The effects on employment

So far, the measures taken to complete the single market cannot be linked to major changes in employment levels in the food, drink and tobacco processing machinery industry that have occurred, for instance, as a result of restructuring in the industry.

Figure 4.13 shows the evolution of employment in the manufacture of machinery for the food, chemical and related industries. Food, drink and tobacco processing machinery accounts for about 40% of employment in this sector or 100,000 employees in 1994.

The most striking observation in Figure 4.13 is that the industry manufacturing food and chemical equipment has been much more successful in maintaining its employment level than has mechanical engineering as a whole. This is not due to a lower productivity growth, which, in fact, as we saw above, is about the same in both sectors. Rather, the manufacture of machinery for the food, chemical and related industries has benefited more from the investment boom in the second half of the 1980s than has mechanical engineering and has been better at increasing its extra-EU exports to compensate for the drop in investment demand in the its home market in the early 1990s. The only other mechanical engineering sector that comes close to matching the performance of the food and chemical machinery industry is the manufacture of other machinery for use in specific branches of industry.

Figure 4.13. Employment in the food, chemical and related machinery manufacturing industries from 1980 to 1994



Source: DEBA.

4.10. The evolution of end-user prices

The creation of a larger market with a larger number of rival enterprises and the removal of trade barriers were expected to lead to increased competition and, hence, to a downward convergence of prices.

Figures 4.14 and 4.15 depict the evolution of the disparity in prices of food, drink and tobacco processing machinery across Member States. Since no information about producers prices is available at this level of detail, the analysis focuses instead on export and import prices, calculated on the basis of data on the value and quantity of trade. The measure of price disparity that has been used is the standard deviation of Member State prices divided by the average (coefficient of variation). The price dispersion is calculated for all Member States and for the countries that are the main producers in this area, namely Germany, Italy, France, the Netherlands, the UK and Denmark.

The reason for this disparity in prices is that trade flows, especially exports, for the other countries are relatively small and also more erratic. The calculated export and import prices for these countries are therefore less representative, but can nevertheless significantly alter the outcome for price disparity. It is thus useful to examine both results.

On the import side, price disparity among all Member States and only among the countries that are the main producers is virtually the same. When we looked at the levels of prices (not displayed here), it is apparent that there is indeed no significant difference between all the Member States when they are grouped together and the countries that are the main producers when they are grouped together with respect to the average import price and the dispersion around that average.

Since 1983, the degree of price disparity has been falling. However, because of a sharp increase in this factor between 1980 and 1983, the coefficient of variation was barely lower in

1992 than in 1980. In 1993, price disparity surged, though this was probably due to the data for that year being unreliable.

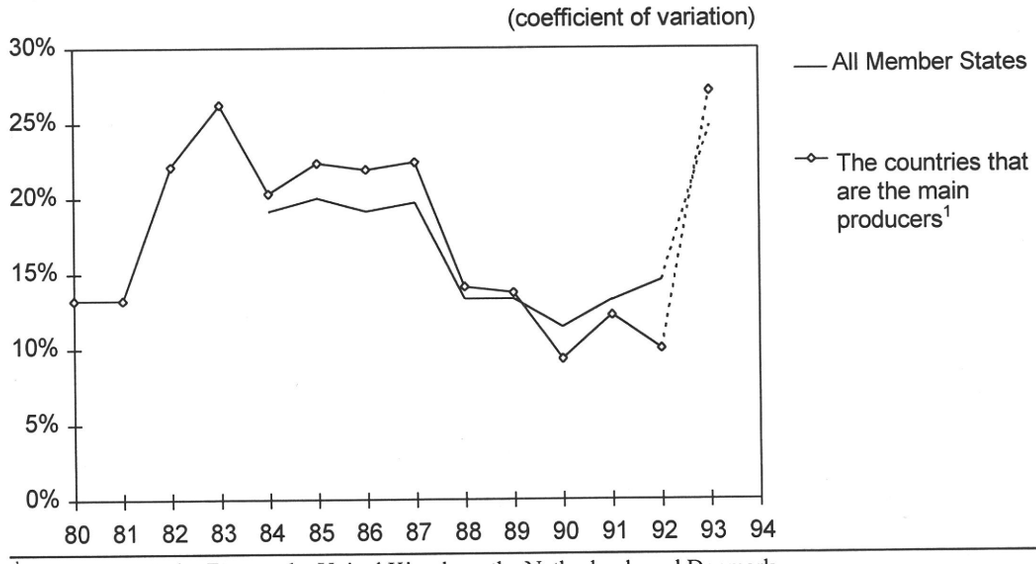
The dispersion of export prices is much larger among all Member States than it is when you look only at those among the countries that are the main producers of this equipment. This difference arises because the average export prices for Ireland, Spain, Greece and Portugal are much lower than the EU average. This does not imply, however, that the same machine sold in Portugal and Germany costs in Portugal only a fraction of what it costs in Germany. Rather, Portugal does not manufacture the same machines as Germany – it produces less sophisticated and therefore less expensive equipment.

Since 1985, the dispersion of export prices among the countries that are the main producers of machines in this sector has been decreasing. The reduction of price disparity has not been steady, though. In 1992, it jumped up again as a result of exchange rate movements that increased prices in Germany and the Netherlands and decreased them in Italy and the United Kingdom. The further jump in 1993 cannot be relied upon to have actually occurred or to have been as marked as this as the data for this year may be unreliable. No similar reduction of price dispersion was visible among the group of all Member States.

Figure 4.16 shows the evolution of the average import and export prices of the Member States. If price convergence has been downwards as a result of the changes this should be visible as a change in the price trend from the mid-1980s onwards, but no clear pattern can be discerned.

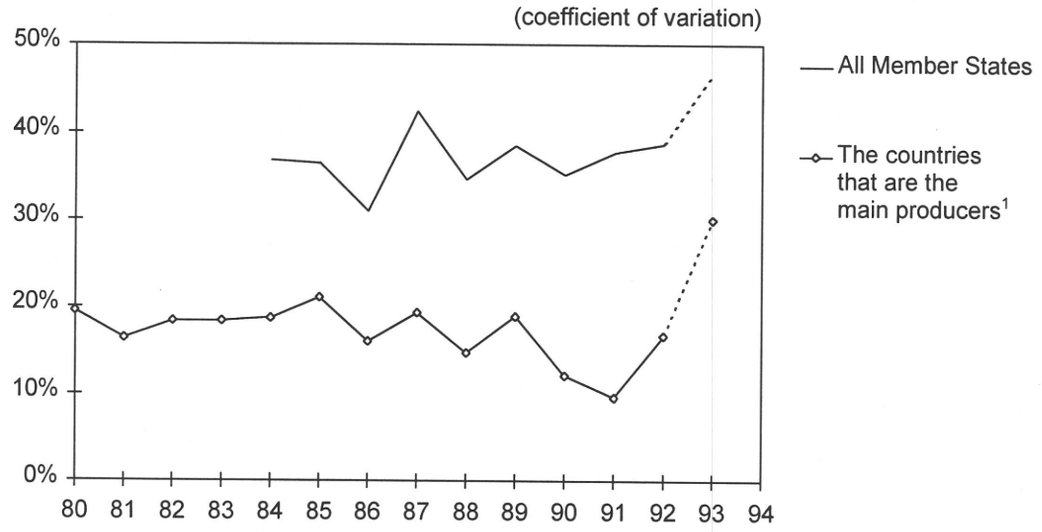
Figures 4.14 to 4.16 illustrate various aspects of the prices of intra-EU imports and exports. When looking at the prices of extra-EU trade (not displayed here) very similar patterns emerge.

Figure 4.14. The dispersion of import prices across Member States (for intra-EU imports) in the food, drink and tobacco processing machinery manufacturing industries from 1980 to 1994



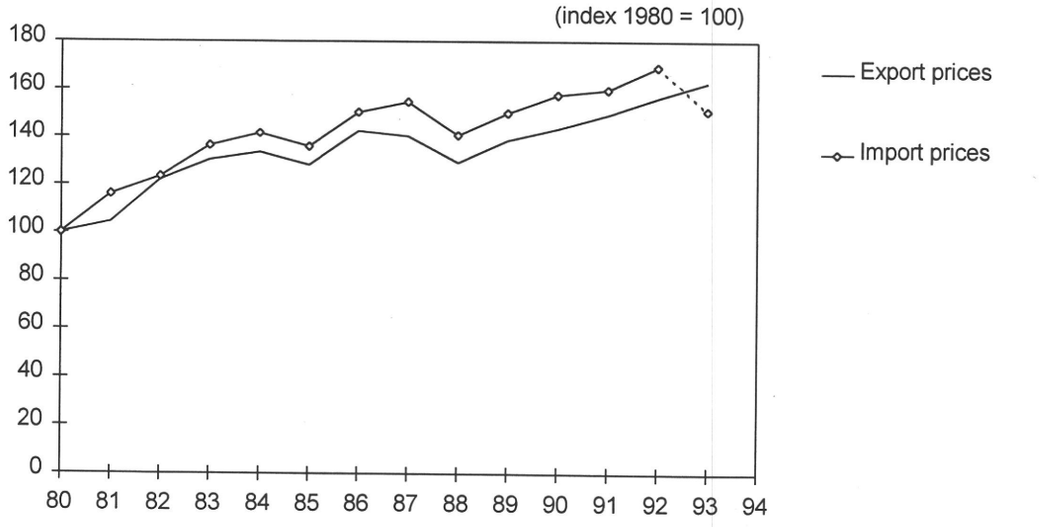
[1] Germany, Italy, France, the United Kingdom, the Netherlands and Denmark.
NB: The data for 1993 are probably unreliable.
Source: Calculations based on data from Eurostat.

Figure 4.15. The dispersion of export prices across Member States (for intra-EU exports) in the food, drink and tobacco processing manufacturing industries from 1980 to 1994



[1] Germany, Italy, France, the United Kingdom, the Netherlands and Denmark.
NB: The data for 1993 are probably unreliable.
Source: Calculations based on data from Eurostat.

Figure 4.16. The evolution of average import and export prices (for intra-EU trade) in the food, drink and tobacco processing machinery manufacturing industries from 1980 to 1994



NB: The data for 1993 are probably unreliable.
Source: Calculations based on data from Eurostat.

5. Business strategy

5.1. The implications of the single market programme for factors that determine corporate strategy

The single market programme has not brought about major changes in the competitive environment in which food, drink and tobacco processing machinery producers operate. The principal reason for this is that trade barriers were already low in most segments of the industry. Manufacturers could usually comply with regulatory requirements in another Member State without having to modify or certify their product. When modifications were necessary, the cost impact was often small as most equipment is customized anyway to the end-users' particular specifications, so additional or different regulatory requirements can be incorporated at little or no extra cost. Regulatory harmonization has therefore not had a significant impact on trade, nor fundamentally altered the nature and level of competition between producers. Moreover, pressure equipment – the type of equipment that was cited most often by those in the industry as being subject to regulatory barriers – is not yet covered by harmonized legislation. As a result, so far, the main response to the single market programme has been the short-term one of complying with the new regulatory requirements introduced by the EU directives covering this area.

The most important recent change in the business environment of food, drink and tobacco machinery producers, according to those in the industry, has been the increase in the scale of buyers and the disappearance of small customers. In the late 1980s and early 1990s, the food, drink and tobacco processing industries, like many other manufacturing and service sectors, undertook a wave of mergers and acquisitions. In the process, many small and medium-sized food processing firms have been taken over by global and pan-European concerns.

The increasing concentration of the food industry has a profound impact on equipment suppliers. In the reorganization that followed the acquisitions, the large food companies have established centralized buying departments. As a result machinery manufacturers face fewer and larger customers. This has changed the nature of the demand for equipment in several important ways:

(a) there is a need to offer diversified product ranges – to rationalize supply, the food processors aim to reduce the number of their suppliers and therefore tend to favour large equipment manufacturers that have a wide product range to satisfy more of their requirements at one stop than would those with smaller ranges;
(b) there is increased customer involvement in product design – large end-users demand equipment built according to their specifications;
(c) there is a demand for integrated systems, instead of stand-alone machines.

5.2. Strategies in the food, drink and tobacco processing machinery industry

The dominant strategy in the food, drink and tobacco processing machinery industry in the last decade has been one of horizontal integration on the part of the leading equipment suppliers. They have extended the scope of their activities to other types of equipment and also to other geographical markets. This strategy has been pursued by means of the acquisition of successful medium-sized companies with highly regarded technology and trade marks that complement the technological capabilities and market access of the acquiring company (the

acquisition activity of the leading food, drink and tobacco processing machinery manufacturers was described under 2.4.3). The large equipment producers have obtained their present shape and size largely as a result of external growth.

Several motivations underlie the strategy of horizontal integration. One is that it is a response to the changing nature of demand, described above. By extending their geographical and product scope, equipment suppliers can now offer large customers a 'one-stop shop', where they can buy a wide range of equipment or complete integrated systems all together.

Another is the realization of economies of scale in marketing and research and development. At least in Europe and North America, the market for food, drink and tobacco processing machinery is mature and, following a period of strong investment spending in the EU in the second half of the 1980s, is expected to grow to only a modest degree. On the other hand, strong end-user demand for customized designs and solutions as well as ongoing technical assistance must be met by an extensive network of sales and service centres. Acquisitions offer the potential to improve the efficiency of sales and servicing networks by extending the product range of the company or by rationalizing the distribution network of the combined enterprise.

While greater geographical and product scope has been at the root of the acquisition strategy of the last decade, the last few years have seen the first steps being taken towards an integration of production operations in order to realize economies of scale in that dimension too. Under 4.4.2, we described how APV has reorganized its operations into a Products Division and an Engineering Division. The former centralizes the production of standardized components and machines in order to pursue increased volume and economies of scale. The latter designs customized solutions for end-users, but it aims for improved productivity in engineering and design by using the standardized components as building blocks.

In addition to horizontal integration and, more recently, rationalization of production, the third strategy pursued by the large producers in the food, drink and tobacco processing machinery industry is international expansion in fast-growth areas, notably Asia and Eastern Europe. This strategy aims to reduce the dependency of the industry on the mature European and North American markets. So far, almost all foreign markets outside Europe and North America have been served by exporting products to them, supported by an extensive international sales and service organization. The production of food, drink and tobacco processing machinery relies on the availability of a highly skilled technical labour force, which is not easy to find or create in countries other than those that have traditionally manufactured these products. However, there are moves to change this. APV has taken the first steps towards local production. In 1994, it opened a plant in China, which assembles fluid-handling equipment and heat exchangers.

Small and medium-sized firms do not have the resources to pursue a strategy of horizontal integration and international expansion and so must follow a focus strategy. The great diversity of the food, drink and tobacco processing machinery industry offers many opportunities for this. Medium-sized firms (those with 50–300 employees) may concentrate on specialized equipment for one or a few end-user segments and market their products world- or Europe-wide. Small firms (those with fewer than 50 employees) are prominent in markets with many small customers, such as equipment for artisan and small industrial bakeries or dairy equipment.

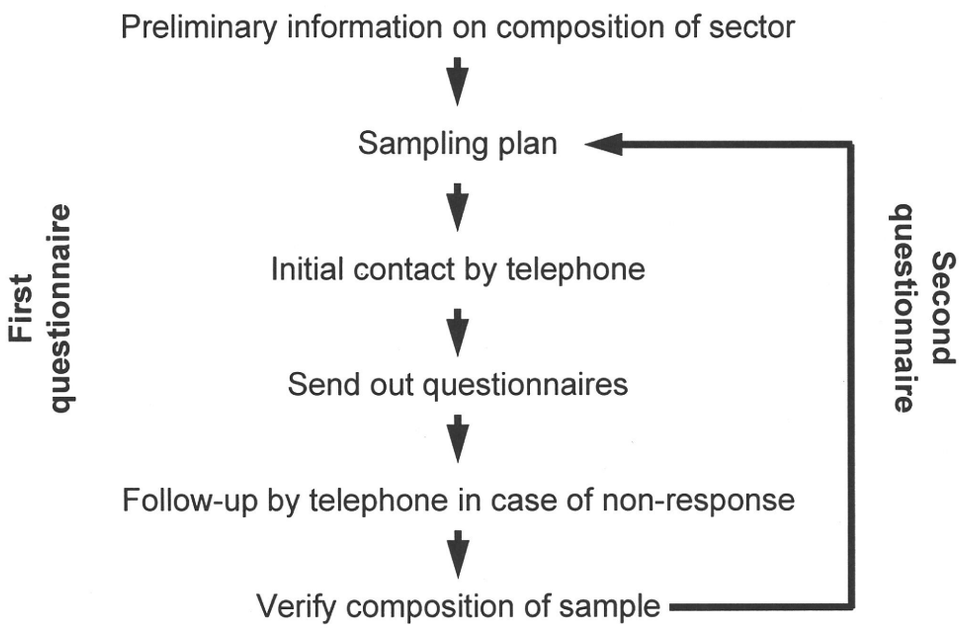
APPENDIX A

Description of the survey of manufacturers

A.1. The procedure adopted for carrying out the survey

The methodology used to choose the sample and conduct the survey is depicted in Figure A.1.

Figure A.1. The methodology used for the survey



A.2. Preliminary information on the composition of the sector to be surveyed

To decide who to send the questionnaire to, information was collected on the composition of the food, drink and tobacco processing machinery sector in the EU. The main sources of this information were industry reports (from Frost and Sullivan [1994] and United Nations [1991]) and statistical data from various sources.

This preliminary research suggested that about 40% of the sector that exists in the Member States of the EU (in terms of value of production) is located in Germany. Five other countries – Italy, France, the Netherlands, Denmark and the UK – together account for most of the rest. A small presence can be identified in Spain and Belgium, while the sector is virtually absent in Ireland, Greece, Portugal and Luxembourg.

There is little information about the composition of the sector by segment. The German and Dutch industry associations (VDMA and FME) provide a breakdown of the sector in their home country, and Frost and Sullivan [1994] present a segmentation of sales (not production) of the European market. However, the classification schemes employed by these sources

differ from each other and contain a large 'Other' category. One can question the relevance of an analysis by product segment because the segments that can be distinguished are themselves very differentiated and show as much variety within as between segments. The 'Bakery' category, for instance, includes the manufacturing of equipment for artisan bakers, machines for industrial baking and equipment for making biscuits, cereals and pasta. The range of end-user markets and technologies within this sector alone is thus very wide.

Similarly, there is only partial information about the sizes of producers. French and Dutch statistics suggest that firms with fewer than 100 employees may account for a third to a half of value added and employment, while companies with 500 employees or more represent less than 10%. It should be borne in mind that statistical offices define a firm as a separate legal entity. Large operators often have a group structure, composed of various corporations in several countries, and in official statistics such an operator would be given as a large firm, rather than several medium-sized firms.

The available information on the composition and structure of the food, drink and tobacco processing machinery industry is summarized in Table A.1.

Table A.1. The composition of the food, drink and tobacco processing machinery industry

Country	Share in production value	Segment	Share in production value	Size (employment)	Share in employment
Germany	40	Meat processing	15	Small (<100)	35-50
Italy	20	Bakery	15	Medium (100–500)	45-60
France	15	Drinks	15	Large (>500)	<10
Netherlands	5-10	Dairy	10		
UK	5-10	Sugar, confectionery	5		
Denmark	3-5	Tobacco processing	5		
Spain	1-2	Other	35		
BLEU	1-2				
Ireland	~0				
Greece	~0				
Portugal	~0				

Source: Various sources (see text).

A.3. The sampling frame

The companies selected to take part in the survey were chosen from three sources:

(a) report of the market research company Frost and Sullivan [1994];
(b) two business directories (*Europages, Kompass*), under the headings devoted to food, drink and tobacco machinery.

Frost and Sullivan makes periodical reports on the European food equipment market. These reports focus on the demand side of the market and do not deal with production and trade. However, at the end they provide a list of about a hundred companies in this market sector. These are generally larger enterprises (those with more than 200 employees).

Business directories only list companies that have paid to be included. Nevertheless, they contain both large and small producers (the smallest we contacted has nine employees). Companies included in these directories usually make international sales, though a few small companies we contacted reported that they only sell to the domestic market.

None of these sources gives systematic information on product segments or the sizes of firms, so the sampling could be conditioned only on the country. The aim was to obtain 10 to 20 responses for each of the countries producing the majority of equipment for this sector (Germany, Italy, France, the Netherlands, the UK and Denmark) and about 5 to 10 for Belgium and Spain. Assuming that only a third of those we mailed the questionnaire to would respond, we aimed at sending questionnaires to three times as many companies as the desired response rate. Table A.2 presents the desired sample and the effective number of questionnaires sent out.

Table A.2. Mailings

	Desired response	Required mailing (assuming 1/3 response rate)	Effective mailing	
			First questionnaire	Second questionnaire
Germany	20	60	30	20
Italy	10	30	24	12
France	10	30	27	12
Netherlands	10	30	30	15
UK	10	30	33	15
Denmark	10	30	24	10
Spain	5	15	9	4
Belgium	5	15	16	6
Ireland			2	
Sweden			7	
Total	*80*	*240*	*202*	*94*

The sources we used to draw up a list of companies to mail the questionnaires to do not give the names of contact people. Therefore, each company was first telephoned to speak to a person – or at least obtain the name of a person - willing and capable of responding to the questionnaire. In smaller companies, this was usually the owner or the general manager; in large firms it could be an official in marketing, product development or quality control.

The number of questionnaires we needed to send out to get the desired number of responses was constrained by the number of companies willing to consider taking part in the survey. To obtain the names of about 300 people the questionnaires could be sent to, we had to contact almost every company listed in the three sources. German companies in particular proved rather reluctant to participate. A few questionnaires were referred by respondents to Ireland and Sweden, although these countries were not being surveyed.

The survey was conducted in two rounds. In the first round, a postal questionnaire was sent to about 200 companies. As this elicited an insufficient number of responses, it was suggested that a second questionnaire be drafted that would take the minimum amount of time to complete. This questionnaire consisted of multiple-choice questions that could be answered simply by ticking boxes. It was wider in scope, but less detailed than the first questionnaire, which contained open questions.

A.4. The response

We received 22 replies in the first round and 34 in the second. A sample size of 56 is reasonable for a small industry such as food processing machinery. Unfortunately, the responses were to two different questionnaires, so the sample for a particular question can be much lower than this total. In general, the questions on sector-specific technical barriers were answered by almost all those who took part, while those on the impact of horizontal barriers and on business strategies were answered by fewer people.

Table A.3 presents a breakdown of the sample by country and size.

Table A.3. Description of the complete sample of 56 companies

	Number of companies				Number of employees			
	Small[1]	Medium[2]	Large[3]	Total	Small[1]	Medium[2]	Large[3]	Total
Total	*22*	*30*	*4*	*56*	*1 161*	*6 122*	*3 500*	*10 783*
Germany	2	4	2	8	115	740	1 650	2 505
Italy	2	7	1	10	50	1 879	1 200	3 129
France	7	6		13	304	1 393		1 697
Netherlands	4	3	1	8	223	610	650	1 483
UK	2	4		6	99	720		819
Denmark	3	4		7	225	520		745
Belgium	2	1		3	145	125		270
Sweden		1		1		135		135

[1] Small defined as fewer than 100 employees.

[2] Medium defined as 100 to 499 employees.

[3] Large defined as 500 employees or more.

The responding companies employ, in total, almost 11,000 people, which is about a tenth of what we estimate is the total number of people employed in the food, drink and tobacco machinery processing industry.

The tables below describe in detail the responses to each of the questions we asked. The structure of the second questionnaire is used as it has the widest scope. However, the responses to the questions in both surveys are shown.

1. What line of products do you manufacture?

Percentages of respondents reporting activity in the following segments[1]			
Fruit and vegetable processing (including fruit juices)	16%	Drinks equipment (including packaging and bottling, excluding fruit juices and dairy drinks)	14%
Dairy equipment (including dairy drinks)	14%	Packaging (excluding drinks)	14%
Meat and poultry processing equipment	10%	Cacao, chocolate, sugar and confectionery	4%
Fish processing equipment	6%	Tobacco processing equipment	0%
Bakery equipment	16%	Other[1]	5%

Number of respondents: 56.

[1] Total exceeds 100% because some companies reported more than one activity.

2. How big is your company?

Small (Fewer than 100 employees)	**Medium** (100–499)	**Large** (More than 500)	**Total**
22	30	4	56

3. In how many countries do you sell your products?

	Average number of EU 12 countries to which manufacturer exports		**Number of respondents**
	In 1985	**Now**	
Small enterprises	5	6	8
Medium-sized and large enterprises	10	11	14

4. Technical harmonization and standardization

		% responding 'Yes'	% responding 'No'	Number of respondents
(a)	Do you produce several variants or models of the same machine?	S: 92 M: 91	S: 8 M: 9	S: 12 M: 34
	If yes, why?			
	- to meet specific requirements demanded by customer	S: 67 M: 82	S: 33 M: 28	S: 12 M: 34
	- to comply with regulations in another EU Member State	S: 25 M: 35	S: 75 M: 65	S: 12 M: 34
	- to comply with regulations of a non-EU country.	S: 8 M: 26	S: 92 M: 74	S: 12 M: 34
(b)	Did the harmonization of health and safety regulations in line with EU directives (mainly the Machinery Directive) cause important costs to your company, related to the modification and adjustment of product lines to the new regulations?	S: 70 M: 46	S: 30 M: 54	S: 20 M: 28
(c)	Did the harmonization of health and safety regulations allow your company to reduce the number of variants or models produced, because the same model will now comply with the regulations of all Member States?	S: 0 M: 11	S: 100 M: 89	S: 12 M: 27
	If yes, did this yield significant savings in cost?	S: 0 M: 7	S: 100 M: 93	S: 12 M: 27

S: small firms (fewer than 100 employees); M: medium-sized and large firms (100 employees or more).

5. CE marking

		% responding:		Number of respondents
(a)	Do the products manufactured by your company carry a CE marking?	**Yes** S: 73 M: 93	**No** S: 27 M: 7	S: 15 M: 30
	Of those responding 'Yes' to question 5(a), % responding:			
(b)	For products carrying the CE marking, is it now more or less costly to comply with the conformity assessment procedures than were preceding arrangements for demonstrating compliance with various national regulatory requirements?	**More** S: 20 M: 25	**Same** S: 80 M: 75	S: 10 M: 27
(c)	Are products carrying the CE marking admitted to the markets of other EU Member States without further controls (by local inspectors)?	**Yes** S: 73 M: 59	**No** S: 27 M: 41	S: 11 M: 27

S: small firms (fewer than 100 employees); M: medium-sized and large firms (100 employees or more).

6. Other single market measures

	% responding:			Number of respondents
	Positive impact	No impact	Negative impact	
(a) Changes in administrative formalities for cross-border shipments of goods within the EU (customs documentation and VAT declaration), and the elimination of border controls.	S: 75 M: 57	S: 25 M: 36	S: 0 M: 7	S: 8 M: 14
(b) Actions to provide a single, EU-wide protection of industrial property rights (patents, trade marks and, in future, utility models and designs).	S: 25 M: 36	S: 75 M: 64	S: 0 M: 0	S: 8 M: 14
(c) Measures to promote competition in the provision of road haulage services.	S: 0 M: 21	S: 100 M: 79	S: 0 M: 0	S: 4 M: 14
(d) Elimination of restrictions on transfers of capital.	S: 20 M: 36	S: 80 M: 64	S: 0 M: 0	S: 5 M: 14
(e) Actions to avoid double taxation (in country of origin and home country) of earnings or profits repatriated by a subsidiary in another Member State.	S: 0 M: 43	S: 100 M: 57	S: 0 M: 0	S: 8 M: 14
(f) Actions to promote openness and fair competition in tender procedures for contracts awarded by public (national and local) authorities in other Member States [1]	S: 0 M: ..7	S: 100 M: ..93	S: 0 M: 0	S: 5 M: 14

S: small firms (fewer than 100 employees); M: medium-sized and large firms (100 employees or more).

[1] Originally two respondents reported the positive impact of legislation aimed at promoting openness and fairness in public purchasing, providing a puzzling result as the industry manufactures no equipment bought by public authorities (except some of the large producers who also manufacture other equipment with applications outside food processing, such as heating equipment for large buildings). One of them could be contacted, and his reply turned out to rest on a misinterpretation of the question.

7. Business strategies

		% responding: Yes	% responding: No	Number of respondents
	Production/Sales/Distribution			
(a)	Establishment of production in other EU countries.	S: 0 M: 21	S: 100 M: 79	S: 8 M: 14
(b)	Increased exports to other EU countries.	S: 25 M: 36	S: 75 M: 64	S: 8 M: 14
(c)	Establishment of distribution network in other EU countries.	S: 0 M: 36	S: 100 M: 79	S: 8 M: 14
(d)	Increased advertising in other EU countries.	S: 0 M: 29	S: 100 M: 71	S: 8 M: 14
	Sourcing			
(e)	Increased purchase of components from other EU countries.	S: 0 M: 50	S: 100 M: 50	S: 8 M: 14
(f)	Increased purchase of business and financial services from other EU countries.	S: 0 M: 0	S: 100 M: 100	S: 8 M: 14
	Acquisitions/Alliances			
(g)	Takeover of other companies.	S: 13 M: 14	S: 87 M: 86	S: 8 M: 14
(h)	Sale of (part of) your company to another company.	S: 0 M: 14	S: 100 M: 86	S: 8 M: 14
(i)	Alliances and cooperative agreements with other companies.	S: 0 M: 7	S: 100 M: 93	S: 8 M: 14

S: small firms (fewer than 100 employees); M: medium-sized and large firms (100 employees or more).

8. Summary

		% responding: Positive	% responding: No impact	% responding: Negative	Number of respondents
(a)	Single market measures.	S: 55 M: 47	S: 35 M: 50	S: 10 M: 3	S: 20 M: 32
(b)	Exchange rate movements.	S: 50 M: 36	S: 25 M: 36	S: 25 M: 29	S: 8 M: 14
(c)	Intensifying competition in EU markets.	S: 25 M: 29	S: 75 M: 57	S: 0 M: 14	S: 8 M: 14
(d)	Expansion into non-EU markets.	S: 13 M: 43	S: 87 M: 57	S: 0 M: 0	S: 8 M: 14

S: small firms (fewer than 100 employees); M: medium-sized and large firms (100 employees or more).

APPENDIX B

Note on sources of data

B.1. European associations

The European manufacturers of equipment for the food industry are associated in the COCEMA (Comité des constructeurs européens de machines alimentaires). The Secretariat of the COCEMA is presently managed by ANIMA, the Italian mechanical engineering association. COCEMA has not been active in a long time and has no information on the industry, nor any viewpoints on industry issues.

The only European association of food processing manufacturers still active at the European level is EBEMA (European Bakery Equipment Manufacturers). It covers only one of many segments of the food machinery sector. The association has no precise data on the industry it represents.

The packaging machinery industry still has a functioning European organization, the COPAMA (Confederation of Packaging Machinery Associations), presently managed by PPMA (Processing and Packaging Machinery Association), the UK association of packaging machinery manufacturers.

B.2. National associations

In most countries, there are no associations dedicated to the manufacture of machinery for the food and related industries. The industry is generally represented by the mechanical engineering association. An overview of national associations and the statistical information they possess, is provided in Table B.2.

B.3. Eurostat

Eurostat publishes data on NACE group 324 (Manufacture of machinery for the food, chemical and related industries), which includes machinery for food processing, packaging and for processes in the chemical, plastics and rubber industries. Variables covered are, among others, production, employment and the number of firms.

The NACE code (NACE 1970) for the manufacture of machinery for the food industry is NACE 324.11, that for packaging machinery NACE 324.2.

B.4. National statistical institutes

Table B.2 gives an overview of the data that can be provided by national statistical institutes.

Table B.1. National data sources: national associations

Country	Association representing machinery for food and related industries	Coverage of association	Data on sales/production of machinery for food and related industries
Belgium	Fabrimetal	Mechanical engineering	No
Denmark	Confederation of Danish Industries	All manufacturing	No
France	FIM	Mechanical engineering	No
Germany	VDMA	Mechanical engineering. Has dedicated department for food processing and packaging machinery	The VDMA has the most extensive data on production of all associations. Data going back to 1980 and fine segment distribution. However, segment definitions and coverage change over time.
Italy	ANIMA	Mechanical engineering	No
Italy	UCIMA	Packaging	Some production data on recent years. Data differ from those of statistical institute.
Netherlands	FME	Mechanical engineering. Has dedicated department for food processing and packaging machinery	Production data going back to 1987. Segment definitions and coverage change frequently. Data differ from those of statistical institute
Spain	Alimentec	Food machinery	No
Spain	Envasgraf	Packaging and graphical equipment	No
UK	MCTCOM	Mechanical engineering	No
UK	PPMA	Processing and packaging machinery, mainly packaging	No

Table B.2. National data sources: statistical institutes

Country/ statistical institute	Data
Belgium/NIS	Data on sales, employment and number of firms for NACE group 324. Goes back to 1980.
Denmark/ Danmarks Statistik	Data on sales, employment and numbers of firms for NACE group 324 going back to 1980. More detailed production data for 1993 and 1994.
France/SESSI	Data on sales, employment, number of firms and composition of value added for food, drink and tobacco processing machinery and for packaging machinery, only for 1993. For earlier years, the sector definition includes machinery for the chemical, plastics, rubber and shoe manufacturing industries.
Germany/SBA	Data on sales, employment, number of firms and composition of value added for NACE group 324, going back to 1980.
Italy/ISTAT	Data on sales, employment, number of firms and composition of value added for food, drink and tobacco processing machinery and for packaging machinery. Some historical data received, but this includes machinery for the chemical and related industries as well.
Netherlands/CBS	Data on sales, employment, number of firms and composition of value added for food, drink and tobacco processing machinery and for packaging machinery.
Spain/INE	Data on sales, employment and number of firms for NACE group 324 going back to 1980.
UK/CSO	Data on sales, employment, number of firms and composition of value added for food, drink and tobacco processing and packaging machinery combined, only from 1985. For earlier years the sector definition also includes machinery for the chemical and related industries and the activities of process contractors.
Ireland/CSO	No data on machinery for food and related industries, nor on NACE group 324.

APPENDIX C

Machine safety legislation in nine Member States prior to the single market programme

Here, a brief description is provided of the machine safety legislation that applied in nine Member States in 1985 prior to the single market programme. The information is summarized from a situation report prepared by a working party of DG III in 1985 (III/819/85 - EN).

C.1. Belgium

General regulations for protection at work are laid down by the Law of 10 June 1952, which has been amended by subsequent laws and decrees.

The provisions dealing with the safety of machinery are divided into two parts. Part A applies to all machinery. It sets out safety requirements for machinery, such as there needing to be protection from moving parts, emergency stopping devices and so on. The provisions are expressed in general terms, spelling out the safety objectives to be met, but not providing technical specifications.

Part B applies to specific types of machinery that are regarded as presenting greater hazards. It covers lifting equipment, woodworking machinery, presses, shearers and milling machines. The provisions add supplementary safety requirements that cover the specific risks posed by the equipment. For instance, the section on milling machines lays down specific requirements for grinding wheel guards. Again, the provisions are general, stating safety objectives that are to be met by the equipment. Technical specifications are provided as guidance in the form of administrative notes issued by the Ministry of Labour. In these, references to national industry standards are made.

The legislation for protection at work is addressed to the employer – the buyer of the equipment. In the order document for machinery, the employer must explicitly insist that the manufacturer respects the provisions of the legislation. The supplier must provide the employer–buyer with a document that explains the measures that have been taken in order that the equipment meets the regulations. This document, however, does not constitute proof of compliance. Rather, this is verified by means of regular inspections of machinery on the employers' premises. Only for woodworking and shearing machinery are checks conducted at manufacturers' or importers' premises prior to its being placed on the market.

C.2. Germany

The Law of 24 June 1968 on the safety of equipment and machines lays down very general requirements for machinery to ensure safety at work and prevent accidents.

Producers or importers can only place machinery on the market in Germany if it conforms to the 'generally recognized technical rules' and provisions on safety at work and prevention of accidents. Deviating from generally recognized technical rules is possible if the same level of safety is assured in other ways.

The law does not provide for mandatory testing or certification prior to items being placed on the market. Manufacturers can, however, submit equipment or components for voluntary testing at about 70 centres accredited by the Ministry of Labour and Social Affairs. These centres confer the GS mark (Geprüfte Sicherheit), which certifies that the items conform to German safety requirements.

There is also the Craft Industry Code. This is addressed to employers and states that they should lay out and run workplaces in a safe manner.

C.3. Ireland

The Safety in Industry Act and the Factories Act lay down requirements for the protection of workers in factories, construction sites and mines against risks related to the dangerous parts of machinery, noise, dust, fumes and other safety and health-related issues. The Safety in Industry Act is addressed to suppliers of equipment (manufacturers or importers) and workers operating the equipment. The Factories Act is addressed at employers.

Specific regulations apply to pressure vessels and lifting equipment.

C.4. Denmark

General provisions on machine safety are laid down by the Decision of the Ministry of Labour of 22 January 1981, on the installation and use of technical equipment, and the Decision of the Ministry of Labour of 19 November 1980, on safety regulations. The regulations cover all equipment, including that which is purely manually driven. It is addressed jointly at users and suppliers. No certification is required prior to placing equipment on the market.

Other Ministry of Labour Decisions lay down specific requirements for certain types of equipment. Such specific regulations apply to lifting and handling equipment, cranes, winches and their platforms, grinding machines and wheels, eccentric presses, chainsaws, fusion welding apparatus and welding electrodes.

Lifting and handling equipment and cranes must be inspected and approved by the Work Inspectorate before being put into use. Winches must be submitted for a type examination by the Work Inspectorate. For grinding machines and wheels a declaration must be made to the Work Inspectorate, accompanied by test results.

C.5. France

Article L233-5 of the Labour Code states the general principle that machinery must be designed and constructed so that it is safe to operate. Article R233-83 lists the types of equipment and machinery covered.

The provisions on machinery are divided into three sets:

(a) general health and safety requirements applicable to all machinery;
(b) general health and safety requirements applicable to certain types of equipment;
(c) specific technical regulations applicable to certain types of equipment.

The legislation is addressed jointly to end-users and suppliers. No prior inspection or certification is required, except for various types of woodworking equipment, presses and guillotine shears and some agricultural machinery (for instance, wheeled tractors).

Lifting and handling equipment falls outside the scope of the Labour Code. Decisions of the Ministry of Labour impose mandatory standards on various types of cranes. The rules are addressed to users.

C.6. Italy

The Law of 27 April 1955 lays down general safety requirements aimed at the prevention of accidents in the workplace. The legislation applies to users and suppliers.

The provisions relating to machinery are distributed over three sections. One section lays down general safety and health requirements applicable to all machinery. A second section adds specific requirements for a few types of equipment (grinding, woodworking and metalworking equipment). A third section deals with electrical machinery.

No certification or tests are required, except for centrifuges.

C.7. Luxembourg

The Grand-Ducal Order of 28 August 1924 lays down provisions aimed at ensuring the health and safety of persons employed in workshops, including safety requirements for machinery. The legislation is addressed at employers and workers. Compliance is monitored by the Inspectorate of Labour and Mines by means of regular visits.

Mechanical hammers must be certified by the Inspectorate. Apart from these, no tests or certification are required.

C.8. Netherlands

A Decree of 1938 on safety in factories and workplaces and a Law of 1980 on circumstances at work lay down general requirements for workplace safety. The legislation is addressed to employers.

Various types of dangerous equipment are the object of specific royal decrees, including lifts, rivet guns, mobile conveyers, threshers, acetylene generators and electric fence controllers. The decrees require manufacturers or importers to comply with the provisions relating to specific hazards posed by the equipment they cover. The provisions given in the decrees vary in the degree of detail they go into, sometimes making reference to technical standards. All equipment is subject to inspection prior to being placed on the market or put into service.

Other types of equipment are included in a Decree of 1940 on dangerous apparatus. It covers some machinery for woodworking, metalworking and the meat industry, and various tools (winches, cranks, ladders). The Decree lists specific provisions for these kinds of equipment, which are addressed to manufacturers or importers. No prior inspection is required, but the law provides for legal redress against manufacturers in the case of accidents, when manufacturers have not respected the provisions.

C.9. United Kingdom

The Health and Safety at Work, etc. Act of 1974 imposes general requirements on employers and equipment manufacturers aimed at ensuring the health and safety of workers. In addition, there are a number of particular Acts or Regulations, primarily addressed at employers, with a more limited scope. The most important of these are the Factories Act of 1961 and the Electricity Regulations.

The health and safety requirements are usually expressed in general terms, stating objectives to be met, but imposing no technical specifications. For some of them the Health and Safety Executive has published Guidance Notes, illustrating by what technical means the safety objectives can be achieved. These guidelines may refer to particular British standards.

Some provisions apply specifically to production equipment. Sections 12–16 of the Factories Act sets out that all dangerous parts of machinery should be securely fenced. For three types of equipment (abrasive wheels, woodworking equipment and horizontal milling machines) this rule has been relaxed by later Regulations. They spell out in detail how to safeguard those using the equipment, but allow the dangerous parts to be exposed.

Except for some lifting equipment, no testing or certification is required by the law. Compliance is verified by Inspectorates of the Health and Safety Executive and by inspectors of local authorities.

APPENDIX D

Simulation methodology and detailed results

D.1. A description of the simulation model

Simulations of the cost impact of horizontal measures were conducted using DRI's industry models of the four largest economies in the EU – Germany, France, Italy and the UK. These models provide a breakdown of 30 industrial and service sectors, one of which is mechanical engineering. A brief description of the basic features of the models follows.

The industry models are 'propagation' models. They rely on forecasting a number of macroeconomic variables (such as overall consumption and investment spending, rates of pay and exchange rates), generated by the macroeconomic model of the countries considered. They also rely on forecasts of prices producers in the key industries in the United States and Japan will be selling their products for in order to measure the level of competitiveness in world markets. These, too, are obtained from relevant economic models. Departing from these inputs, the industry models make forecasts of output, exports and imports, prices and employment for each of the 30 sectors covered in the study.

Within each country, the sectors are interrelated by means of an input–output framework. This allows a sector-specific detailed model of demand and costs to be made. In particular, it permits us to take into account the intermediate demand for the goods or services sold by a sector to the other branches of the economy, as well as the cost of intermediate inputs purchased by the sector from other industries that supply them.

The interdependence of countries is recognized by including a trade bloc in the model, linking the four large European economies with each other and with the rest of the world. Specifically, a country's exports of a given good depend on the other countries' imports of that good, on world demand and on price competitiveness. Similarly, a country's imports of a good depend on domestic demand for the good, as well as on the price of the imported good in relation to the prices domestic producers charge for the same good. Thus the prices of imported goods are determined by the prices of exported goods prevailing in other countries.

D.2. The methodology used in the simulation

The industry models can be used to make simulations as well as forecasts. Simulations provide a means of investigating the impacts policy measures can have. To do this, the measures are translated into a set of assumptions about the exogenous variables (for instance, exchange rates) or model equations (for instance, a change in the input–output coefficients). The model is then run under this set of assumptions. If the computed outcome is then compared with the simulation under the original base scenario, it yields an indication of the impact the policy is likely to have.

The horizontal measures of the single market programme are modelled as shifts in the cost and price equations. Specifically, the abolition of customs formalities and border controls is translated as a downward shift in import and export prices and deregulation as a downward shift in the producer price of the deregulated good or service. After these assumptions have

been incorporated, the model is run to evaluate the impact these will have on key variables of the mechanical engineering sector.

The industry model can only give rough indications as to the impact the horizontal policy measures examined will have on the food, drink and tobacco processing machinery industry. There are several reasons for this. First, the model used only covers the four largest European economies – Germany, France, the UK and Italy. The country coverage need not be problematic, though, as these four countries account for more than 80% of the production of food, drink and tobacco processing machinery in the EU, the Netherlands being the only other major producer. Second, the model does not provide sectoral detail below the level of mechanical engineering as a whole. This means that the simulations can only yield reasonable indications if the food, drink and tobacco processing machinery industry is similar to that of mechanical engineering as a whole. From the information available on the manufacture of machinery for the food, chemical and related industries, it would seem that this is indeed the case. Using the model to simulate what the results would be if changes were made in production and trade quantities, on the other hand, is much less meaningful as the mechanical engineering sector has a different demand structure to this more specialized sector and, because of its large size, exercises a significant impact on the rest of the economy. Third, although export demand for a given country depends on imports in the other countries included in the model, no distinction is made between intra-EU and extra-EU exports. Therefore, the downward shift of trade prices resulting from the abolition of customs formalities applies to all trade, not only intra-EU trade.

It has been assumed that the policy measures are to be implemented in one go in 1992. The impact is measured as the difference between the scenarios with and without policy measures in 1995.

D.3. The results of the simulation

The tables that follow present the assumptions that were made regarding the direct impact of the horizontal policy measures and the impact of the policies on key variables of the mechanical engineering sector.

Table D.1 presents the results of the impact of the changes in customs formalities. It has been assumed that they will yield a direct reduction in trade prices, as the administrative and time costs associated with border-crossings are removed. Due to the lack of more recent information, estimates on the direct impact on costs which the abolition of customs formalities will have are freely taken from a study conducted by the Directorate-General for Economic and Financial Affairs in 1987. The study constructed an overall assessment of the potential effects of completing the single market, assembling and integrating information from 'The cost of non-Europe' studies.[42] The assumed direct effects the abolition of customs formalities will have on trade prices are detailed in the top panel of Table D.1. Various scenarios are investigated, with and without a differentiated impact by sector and country.

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42 European Commission, 'The economics of 1992', *European Economy*, No 35, March 1988.

In scenario 1, the abolition of customs formalities is assumed to induce an immediate downward shift of import and export prices in all industries and Europe-4 countries by 1.6%. This was the minimum estimate in the study of the Directorate-General for Economic and Financial Affairs mentioned above. In scenario 2, the immediate impact is still 1.6%, on average, but it differs by industry and country. Again, the estimates are based on those used in the DG II 1987 study. In scenario 3, the elimination of customs formalities is assumed to shift trade prices by 1.9% in all Europe-4 countries and industries. Finally, scenario 4 assumes an immediate impact which differs by country and industry, but with an average of 12.9%.

The industry model is then simulated to show the effect of the downward shifts in trade prices resulting from the abolition of customs formalities. The simulation results for the mechanical engineering sector in Europe-4 for each scenario are shown in the bottom panel of Table D.1. Looking at the first row of the bottom panel, the elimination of customs formalities is seen to reduce producer prices in the mechanical engineering sector in Europe-4 by about 0.2% in all scenarios. This amount was used as an estimate of the gains from the elimination of customs formalities in the main report (see Table 4.3).

Table D.2 presents the results for the impact of deregulation. The effects of deregulation are modelled as a direct reduction of the price of the deregulated goods or services. Two scenarios were examined, based loosely on the assumptions used in the above-mentioned study of the Directorate-General for Economic and Financial Affairs. They are presented in the top panel of Table D.2. In scenario B, deregulation is assumed to have been more effective than in scenario A.

The model is then simulated to investigate the impact of the price reduction in the deregulated goods and services on the mechanical engineering sector in Europe-4. The results are shown in the bottom panel of Table D.2. Deregulation is seen to reduce producer prices in the mechanical engineering sector by 1% (scenario A) to 2.2% (scenario B). The lower estimate was used in the main report (see Table 4.3).

Table D.1. The results of the simulation of the impact of the abolition of customs formalities

	Scenario 1	Scenario 2			
	Assumed direct impact on trade prices				
	Europe-4	Germany	France	Italy	UK
Agriculture, fishery and forestry	-1.6	-2.9	-1.8	-1.5	-1.6
Fuel and power products	-1.6	-0.7	-0.8	-0.7	-0.8
Iron and steel	-1.6	-0.4	-0.7	-0.7	-1.6
Non-ferrous metals	-1.6	-0.4	-0.7	-0.7	-1.6
Non-metallic mineral products	-1.6	-0.4	-0.7	-0.7	-1.6
Basic chemicals	-1.6	-0.4	-0.7	-0.7	-1.6
Pharmaceuticals	-1.6	-0.4	-0.7	-0.7	-1.6
Speciality chemicals	-1.6	-0.4	-0.7	-0.7	-1.6
Metal products	-1.6	-1.5	-0.8	-0.7	-1.8
Mechanical engineering	-1.6	-1.9	-4.0	-2.1	-2.5
Office, EDP and precision instruments	-1.6	-1.1	-1.4	-1.6	-1.9
Electrical equipment for consumers	-1.6	-1.1	-1.4	-1.6	-1.9
Electrical equipment for industry	-1.6	-1.1	-1.4	-1.6	-1.9
Motor vehicles	-1.6	-0.5	-0.4	-0.5	-0.7
Aerospace equipment	-1.6	-0.5	-0.4	-0.5	-0.7
Other transport equipment	-1.6	-0.5	-0.4	-0.5	-0.7
Food, drink and tobacco	-1.6	-1.4	-0.7	-0.5	-1.1
Textiles and clothing	-1.6	-2.3	-2.5	-2.2	-1.4
Pulp, paper and paperboard	-1.6	-1.6	-1.8	-1.5	-1.9
Printing and publishing	-1.6	-1.6	-1.8	-1.5	-1.9
Miscellaneous industries	-1.6	-1.6	-1.8	-1.5	-1.9
Rubber and plastic products	-1.6	-1.6	-1.8	-1.5	-1.9

	Impact on mechanical engineering in Europe-4 (% change compared to no measures, simulation results)	
Producer prices	-0.2	-0.1
Import prices	-1.6	-2.5
Export prices	-1.8	-2.5
Production	0.7	0.9
Imports	0.8	1.3
Exports	1.6	2.5

Table D.1 (continued)

	Scenario 3	Scenario 4			
	Assumed direct impact on trade prices				
	Europe-4	**Germany**	**France**	**Italy**	**UK**
Agriculture, fishery and forestry	-1.9	-2.2	-1.4	-1.2	-1.3
Fuel and power products	-1.9	-3.1	-2.3	-1.3	-1.9
Iron and steel	-1.9	-1.1	-0.9	-0.9	-1.5
Non-ferrous metals	-1.9	-1.1	-0.9	-0.9	-1.5
Non-metallic mineral products	-1.9	-1.1	-0.9	-0.9	-1.5
Basic chemicals	-1.9	-1.1	-0.9	-0.9	-1.5
Pharmaceuticals	-1.9	-1.1	-0.9	-0.9	-1.5
Speciality chemicals	-1.9	-1.1	-0.9	-0.9	-1.5
Metal products	-1.9	-1.8	-1.3	-1.6	-1.6
Mechanical engineering	-1.9	-2.3	-3.1	-2.3	-2.2
Office, EDP and precision instruments	-1.9	-0.7	-1.0	-1.0	-1.3
Electrical equipment for consumers	-1.9	-1.8	-1.9	-2.2	-2.3
Electrical equipment for industry	-1.9	-1.8	-1.9	-2.2	-2.3
Motor vehicles	-1.9	-1.7	-1.2	-1.5	-1.1
Aerospace equipment	-1.9	-1.7	-1.2	-1.5	-1.1
Other transport equipment	-1.9	-1.7	-1.2	-1.5	-1.1
Food, drink and tobacco	-1.9	-2.6	-2.0	-2.0	-2.4
Textiles and clothing	-1.9	-0.8	-1.3	-1.1	-1.2
Pulp, paper and paperboard	-1.9	-1.4	-1.5	-1.4	-1.5
Printing and publishing	-1.9	-1.4	-1.5	-1.4	-1.5
Miscellaneous industries	-1.9	-1.7	-1.9	-1.7	-2.0
Rubber and plastic products	-1.9	-2.4	-1.9	-2.1	-1.9
	Impact on mechanical engineering sector in Europe-4 (% change compared to no measures, simulation results)				
Producer prices	-0.2	-0.2			
Import prices	-1.9	-2.4			
Export prices	-2.1	-2.6			
Production	0.8	0.9			
Imports	1.0	1.2			
Exports	1.9	2.4			

Table D.2. The results of the simulation of the impact of deregulation

	Scenario A	Scenario B
	Assumed direct impact on prices in the deregulated sector (%)	
Energy	0	-5
Iron and steel	-5	-5
Transport services	-5	-10
Telecommunication services	-5	-10
Financial services	0	-5
Business services	0	-3
	Impact on mechanical engineering sector in Europe-4 (% change compared to no measures, simulation results)	
Producer prices	-1.0	-2.2
Import prices	-0.7	-1.1
Export prices	-0.9	-1.8
Production	0.2	0.6
Exports	0.2	0.3
Imports	0.0	0.0

APPENDIX E

Case studies

E.1. A medium-sized company making equipment for processing potatoes and making baby food

GMF Gouda is based in the Netherlands and manufactures various types of machinery for the food processing industry, mainly ones used for processing potatoes and making baby food. The company supplies complete processing lines and plants, customized to the buyers' specifications. GMF employs 160 people and exports to about 80 countries, including all EU Member States. The company's annual turnover amounts to ECU 25 million.

Before the implementation of the single market programme, the company did not have to alter or certify its machinery for commercialization in another EU Member State, with one exception. This exception still exists at present. In the drying machines manufactured by GMF, a liquid is passed between hot cylinders to produce a thin dried layer. The cylinders are heated by steam and are under pressure. Thus, each drying machine must be inspected and certified by a national testing agency, to verify that safety precautions have been taken to reduce the hazards steam pressure present. The costs of certification are about ECU 2,500, representing 1% of the value of a typical machine worth ECU 250,000. As the tests are mandated for all units, foreign suppliers do not incur discriminatory costs. Safety requirements related to pressure equipment are not covered by EU directives but are still regulated by national legislation. The Commission's proposed Pressure Equipment Directive is still under discussion in the Council and the Parliament.

For other equipment, GMF applies the same high safety standards for customers in all countries. Safety-related features are essentially the same for all equipment sold and do not depend on the importing country.

The company started its preparations for compliance with the Machinery Directive two years ago. A coordinator was appointed as the person responsible for the implementation of the Directive in GMF. His main function was to collect information on the Machinery Directive and its implications for the equipment manufactured by the company, then disseminate this to all employees responsible for issues affected by the Directive.

The coordinator took courses on the Machinery Directive and called in an outside consultancy to give a presentation to all the employees in the company whose areas of work would be affected, especially those involved in the design of equipment. The courses and the presentation proved extremely useful for identifying which standards applied to them so that then they could ensure that their machines would comply with the general and unspecified safety and hygiene requirements of the Machinery Directive.

The main sources of standards are the European norms or proposals for European norms developed by the CEN and those developed by the Unification Commission in the UK, whose work is used by the CEN. All information on relevant standards is written down in technical memos and distributed to the relevant employees in the company. The coordinator is the contact person for all questions regarding the Machinery Directive that might arise in the design or production process. Furthermore, he is responsible for verifying that each machine

manufactured by GMF conforms to the requirements after the design and production phases have been completed. For this, he has developed a checklist, based on the contents of the Machinery Directive.

In the course of preparing for compliance with the Machinery Directive, GMF has spent some ECU 20,000, of which about ECU 5,000 went on documentation and the presentation and ECU 15,000 on management and training time. This represents a little under 0.1% of its annual turnover. The costs related to the gathering of information continue to the extent that new norms are developed.

Only minor modifications needed to be made to enable the equipment to conform with the requirements of the Machinery Directive – these mainly took the form of extra protective guards. The exception was the drying equipment, where more extensive alterations were needed. The liquid passing between the hot cylinders poses hazards to the operator. The process cannot be cased in because visual inspection is required to control the process. To make these machines comply with the Machinery Directive, therefore, the safety distances needed to be carefully worked out and additional protective guards had to be installed.

The required modifications increased the manufacturing costs by ECU 500 to 10,000, depending on the machine type, representing 0.2–4% of the value of a typical machine selling at ECU 250,000.

The administrative costs incurred for conformity assessment are small. As the equipment is produced in units, a technical file must be drawn up for each unit sold. However, the equipment is composed of a limited set of modules and there is also a limited number of recurring machine types. Consequently, a large part of the technical file for a new machine can be pulled from previously made files.

GMF did not take any measures with respect to the Electromagnetic Compatibility Directive. This is because the electrical and electronic parts it uses are obtained from suppliers and they will be required to meet the relevant norms.

Apart from making the necessary modifications to comply with EU legislation, GMF did not change its product or marketing strategies. The equipment it produces has always been made to uniform high safety standards, which were accepted by all its customers.

E.2. A medium-sized company making grain processing equipment

Golfetto is based in Italy and manufactures all sorts of equipment used in grain processing and milling. The company has 200 employees and exports to 40 countries, 9 of these being Member States.

The equipment made by Golfetto is used in potentially explosive atmospheres (there is a risk of dust explosions) and is subject to the national regulations of the countries it sells to, which may differ one from another. The equipment is supplied in about five variants with different safety devices in order to meet the specific regulations of the company's main markets, which are Germany, Italy, the UK, France and the US. Equipment exported to other countries is made according to one of the five models.

Tests are only required in Germany and then only a specimen of each machine type must be tested. For example, Golfetto manufactures filters in four different sizes, ranging in price from ECU 15,000 to 30,000. For them to be sold in Germany, an example of each size must be tested at a cost of about ECU 1,500 per test. Under EU regulations, type testing would probably not be required.

Equipment for use in potentially explosive atmospheres is still regulated by national legislation as a relevant EU directive is not yet in force. Consequently, single market legislation has not permitted the company to simplify its product range and reduce the number of different safety systems it has to incorporate into its machines. Golfetto has only made very small modifications to its equipment in response to the Machinery Directive. The company follows closely the development of European norms and will apply the relevant norms when they are completed. It feels that advances in this area should take priority over new legislation.

Since Sweden entered the EU, Golfetto purchases ball bearings and engines from Swedish suppliers. The removal of customs formalities and border controls significantly shortened delivery times and reduced transport costs. Formerly, customs border controls had impeded imports of Swedish components.

In other respects, the company did not change its production or marketing strategies in response to the single market.

E.3. A medium-sized subsidiary of a large company

Heat and Control Limited is the European subsidiary of the US firm Heat and Control Incorporated. Employing about 100 people in its factory in Scotland, the company produces handling equipment for the drinks industry and various types of machinery for the confectionery sector. Before being acquired by the US parent company in 1984, it already manufactured heat and control equipment under licence. The company serves markets in Europe, Africa and the Middle East.

Heat and Control works on a contract basis and supplies complete installations customized to buyers' specifications. Exports to other EU Member States have never needed to be tested and certified. Apart from the electrical system, which is adapted to the local electricity supply, all equipment is essentially built to British standards, which are accepted everywhere except Germany. The German regulations relating to electrical safety are very demanding and can increase the cost of equipment produced to sell in Germany by up to 5%. These additional costs mainly result from the more expensive materials and greater length of time involved in making equipment that conforms to German regulations.

No significant modifications were needed to ensure that the company's equipment would comply with the EU's requirements. In contrast, the company has incurred sizeable redesign costs in the past so that its products would meet the ever more demanding British regulations. The costs of this were spread over many years and have never been quantified. Observance of British regulations ensures compliance with most of the requirements of EU directives.

Recently, the company has put considerable effort into redesigning its equipment range and introducing new models. This was, however, in response to demands from large customers.

The only cost savings attributable to the changes arising as a result of measures relating to the single market are those that accrue from the simplification of customs formalities. However, they may amount to just 0.1% of annual turnover.

The most costly EU intervention, according to the company, has been the rationalization of the steel industry, which has pushed stainless steel prices up by a fifth in recent years. Stainless steel is one of the main materials used in the construction of food processing equipment. No producer of this raw material has remained in the UK, so stainless steel now has to be imported from Sweden.

Bibliography

Ernst and Whinney. 'The cost of non-Europe: Border-related controls and administrative formalities', in European Commission, *Research on the 'Cost of non-Europe': Basic findings*, Vol. 4, Office for Official Publications of the European Communities, 1988.

European Commission. *Completing the internal market*, COM(85) 310 final, 1985.

European Commission. 'The economics of 1992', *European Economy*, No 35, 1988.

European Commission. 'The social dimension of the internal market', *Social Europe*, special edition, Office for Official Publications of the European Communities, 1988.

European Commission. *The Community internal market*, 1993.

European Commission. *23rd annual report on competition policy*, 1993.

European Commission. *Completing the internal market:* Vol. 2, *The elimination of frontier controls*, Vol. 4, *A new Community standards policy*, and Vol. 6, *Community social policy*, 1994.

European Commission. *Strengthening the competitiveness of the European machinery construction industry*, COM(94) 380/2 final, 1994.

European Commission. *Report of the group of independent experts on legislative and administrative simplification*, COM(95) 288 final/2, 1995.

European Commission. *The single market in 1994*, COM(95) 238 final, 1995.

European Research Associates and Prognos. 'The cost of non-Europe: Obstacles to trans-border business activity', in European Commission, *Research on the 'Cost of non-Europe': Basic findings*, Vol. 7, Office for Official Publications of the European Communities, 1988.

Frost and Sullivan. *European Industrial Food Processing Equipment Markets*, 1994.

Groupe MAC. 'Technical barriers in the EC: Illustrations in six industries', in European Commission, *Research on the 'Cost of non-Europe': Basic findings*, Vol. 6, Office for Official Publications of the European Communities, 1988.

Mason, Geoff, and Finegold, David. *Productivity, machinery and skills in the United States and Western Europe: Precision engineering*, Discussion Paper No 89, National Institute of Economic and Social Research, December 1995.

Massimi, Pierre, and Van Gheluwe, Jean-Pierre. *Community legislation on machinery*, Office for Official Publications of the European Communities, 1993.

Pratten, C. 'A survey of the economies of scale', in European Commission, *Research on the 'Cost of non-Europe': Basic findings*, Vol. 2, *Studies on the economics of integration*, Chapter 2, Office for Official Publications of the European Communities, 1988.

UNIDO, *Industry and Development Global Report 1992/93,* Chapter V. J.: *Food-processing machinery*, 1992.

United Nations, Economic Commission for Europe, *Food-processing Machinery*, 1991.