
The effects of economic integration on the specialisation and geographical distribution of industrial activity in the EU countries

The authors of this article are Esther Gordo, María Gil and Miguel Pérez of the Directorate General Economics, Statistics and Research.

1. INTRODUCTION

The theory of international trade and economic integration suggests that the progressive lifting of barriers to trade and the free circulation of factors, as entailed by a process of regional integration as far-reaching and extensive as that which has taken place among European countries, may considerably impact the productive structure of these countries by providing for a more efficient reallocation of production factors. The enlargement of markets accompanying this development may thus make for efficiency improvements by means of a greater harnessing of economies of scale or of the differences in factor endowment, helping bring about substantial changes in European countries' productive processes. Further, the benefits of localisation, differences in labour skills and in the degree of innovation and of adaptation to new technologies, and many other factors currently differentiating the EU countries might have driven changes in the regional distribution of production in a setting of economic integration.

The studies by Krugman (1991) for the United States showed that US industrial production was distributed very unevenly across the different states. Large industrial clusters located in specific regions contrasted with other areas where the presence of industry was rather insignificant. The disclosure of this industrial activity distribution pattern aroused some interest on the potential impact of the successive advances in European integration on the localisation of activity across Europe. Moreover, in a single monetary area the study of existing disparities in productive structures is of particular importance in that such disparities have a direct bearing on the degree of exposure to asymmetrical shocks, therefore having significant consequences for the pursuit of the single monetary policy. Finally, changes in the composition of industrial activity and in the spatial distribution of industry influence growth and the distribution of income across the countries participating in an integration project, potentially contributing to easing or exacerbating existing disparities. Hence, an analysis of the countries in which the production of the most dynamic sectors with the highest potential growth has tended to locate and of the determinants of these localisation patterns is pivotal for understanding real convergence processes.

This paper aims to analyse the extent to which the ongoing process of integration of Eu-

European countries may have affected their productive structures and, in this context, to frame the changes the Spanish economy has undergone. To do this, information on the production at current prices of the various manufacturing activities is used, drawn from the Eurostat Structural Business Statistics (sbs-plus) database. These figures are available for the period 1988-1998, in accordance with the 3-digit breakdown of the Statistical Classification of Economic Activities in the European Communities (NACE Rev.1). So as to obtain greater clarity in the presentation and discussion of the results, these activities have been grouped into 20 major branches which, in turn, are classified into four categories depending on whether their technological intensity is high, medium-high, medium-low or low (1). This classification is very useful when presenting the results since, traditionally, the most technologically intensive sectors are those showing more buoyant demand and greater growth potential, in addition to requiring higher skills from their employees. Conversely, the low-technology sectors are those with moderate demand and are unskilled-labour-intensive.

Nonetheless, the period studied ended in 1998, so it is not possible to examine the changes that may have derived first, from a fully functioning European Monetary Union; further, from the liberalisation measures adopted with a view to the future enlargement of the EU towards the central and eastern European countries; and, finally, from the efforts made by many European countries to provide access and the adaptation of their economies to the new information and communications technologies, efforts which, as is known, have been on a most sizeable scale in recent years.

With this information it is sought to quantify the specialisation of EU countries and the concentration of productive activity. In this respect, the concept of specialisation used in this article refers to how a country's production is distributed among the different productive branches, compared with the rest of its trading partners, attempting to evaluate their degree of similarity to or divergence from the other EU countries (relative specialisation). The term concentration refers to how the production of a specific industry is distributed among the various countries considered, without taking into consideration the size of the manufacturing output of each of these countries (absolute concentration). In or-

(1) The OECD draws up this classification of manufacturing industries on the basis of their technological intensity, having regard to the proportion accounted for by research and development spending by each sector in their value added or production [see OECD (2001)].

der to make a quantitative approximation to both aspects, the empirical literature has devised numerous measures or indices which draw together in a single value the degree of specialisation of the country or the degree of concentration of an industry, although none of these may be considered as optimal. This article presents exclusively the results obtained on using the Gini relative specialisation and absolute concentration indices. The Gini index is that habitually used to measure the degree of inequality of income distribution among individuals or households (2).

The article is structured as follows. Section 2 briefly discusses the consequences arising from economic theory and the conclusions obtained by other papers on this subject. Section 3 then examines the characteristics of the productive specialisation of the EU countries and the changes undergone in the decade running from 1988 to 1998. This allows the existing differences or similarities in their productive structures to be established, helping ascertain whether these differences have tended to increase or ease off in recent years. The fourth section studies the geographical distribution of manufacturing activities in the European Union so as to determine which activities are more concentrated or more dispersed in the European geographical space and to evaluate whether this distribution has changed over time. Finally, the main conclusions of the paper are drawn.

2. REVIEW OF THE THEORY OF INTEGRATION AND OF THE LOCALISATION OF PRODUCTION, AND OF THE MAIN EMPIRICAL PAPERS

Among the main strands making up the theory of economic integration and that of the localisation of activity [inter alia, see Baldwin and Venables (1995)], we can firstly distinguish neo-classical theory or the Heckscher-Ohlin model, developed in a perfect competition framework.

(2) A paper expanding upon the content of this article is currently being finalised. It calculates a broad set of indices, which includes measures of specialisation and concentration in absolute and relative terms. These indices are prepared using both production and export figures, both at current prices, with the aim of analysing whether they lead to similar conclusions. Moreover, where it has been possible, the indices have been drawn up also using the value added of each branch or industries. Finally, two different information sources are used to obtain these variables: the OECD STAN database, and Eurostat's Structural Business Statistics (sbs-plus) database. These different perspectives generally provide very similar conclusions as to the specialisation and distribution of activity, although the results obtained with the export figures show some discrepancies in relation to the production results.

Under the assumptions of this model, the elimination of obstacles to free trade enabled each country to specialise in the production and export of those goods making intensive use of the production factor in which it has a relative abundance and which, therefore, it produces at a relatively lesser cost (comparative advantage) compared with its trading partners. Hence, as a result of this specialisation process, economic integration would tend to accentuate the disparities in the productive structures of integrating countries, giving rise to an increase in inter-industrial trade (i.e. trade in products belonging to different industries). Such trade would be all the greater the bigger the differences in factor endowment.

Nonetheless, numerous studies have highlighted certain characteristics of international trade that prove difficult to reconcile with the tenets of the conventional model of trade. In particular, most trade at present is between industrialised countries that have a relatively similar endowment of factors. Moreover, a significant proportion of this trade is intra-industrial, i.e. simultaneous trade in differentiated products belonging to a single industry.

To explain these international trade trends, the so-called "new theory of international trade" arose in the eighties. This attached particular importance to market structures and business strategies as determinants of productive specialisation and of international trade in manufactured goods by admitting the existence of imperfect competition, economies of scale internal to the firm and horizontal differentiation of products. In this context, integration agreements allow for more efficient use of economies of scale by making it possible for each country to specialise in the production and export of a specific number of varieties of a single good within each industry, with it tending to import the remaining varieties (therefore giving rise to an increase in intra-industrial trade). In contrast to the inter-industrial specialisation derived from the neo-classical model, countries would not specialise in the output of an industry in particular but rather in the output of varieties within each industry, so that the productive structure of countries would not have to undergo major changes and, consequently, a transfer of resources and productive factors across the different sectors would not be necessary [see Krugman (1979)].

The aforementioned models offer very different conclusions on how the productive structures of countries immersed in a process of integration may evolve; however, in both cases, industrial activity will be distributed among all of them, in accordance with their comparative advantages or with the characteristics of the in-

dustries, helping boost their convergence in terms of income. In contrast to the foregoing, some more recent theoretical developments, which may be incorporated under what has been called "economic geography", highlight the existence of certain external economies or "economies of agglomeration" which may, in an integration context, be conducive to production tending to be concentrated in those countries with more extensive markets and/or a more developed industrial base (3), accentuating the existing disparities in income distribution [see Fujita *et al.* (1999) and Ottaviano and Puga and (1997)].

Among these economies of agglomeration are, firstly, those derived from the existence of industrial links [Venables (1996)]. In particular, insofar as the final destination of the production of certain companies is not household consumption but is rather as an input in other productive processes, input-demanding firms will tend to locate close to the producers of these goods to reduce transport costs and, consequently, production costs. In turn, the concentration of input-demanding firms will attract a greater number of producers of these goods, since that enables them to take better advantage of economies of scale in production. In this way, there is a process involving the cumulative concentration of industrial activity in those countries which, at the time of integration, have a more developed industrial base. Secondly, the existence of external economies of a local or national scope which originate from the accumulation of human or technological capital are a further factor driving agglomeration, in that the existence of an industrial core usually entails the formation of specialised labour markets and of research and technological innovation centres.

In any event, the consequences for the distribution of activity and of income arising from the new economic geography are ambiguous and ultimately depend on the assumptions made regarding labour mobility. Indeed, the latest industrial localisation models consider that the lack of high cross-country labour mobility contributes to mitigating production concentration processes, since the concentration of activity in an area might entail an increase in wages and, therefore, in production costs, potentially

(3) The assumptions underlying these models incorporate the existence of economies of scale in production and of transport or commercialisation costs of an intermediate level. That is to say, for there to be a tendency towards the agglomeration of activity, transport costs cannot be so high that companies tend to locate close to those demanding their products, nor so low that the distance between companies or the distance between companies and final consumers is of no importance.

offsetting the advantages derived from concentration [see Puga (1999)]. This consideration may prove particularly telling in the European context, since many studies have noted the limited cross-country labour mobility in the euro area.

In sum, the theory of international trade and of industrial localisation is ambiguous when it comes to specifying the characteristics of productive adjustment and the changes in the spatial distribution of production derived from integration agreements. Consequently, determining the extent to which integration processes boost the convergence or divergence of productive structures and the dispersion or concentration of production is an eminently empirical question.

The empirical papers available also offer widely varying conclusions on these matters [see Midelfart-Knarvik *et al.* (2000), Amiti (1999) and Brühlhart (2001), among others]. The lack of common findings is due in part to the differences in the time and geographical scope considered by these papers in analysing industrial production patterns, as well as to the different databases, concepts, variables and indicators used to measure the geographical specialisation and concentration of production. Against this background, the only consensus there appears to be is that progress in economic integration has not prompted sharp changes in the productive structures of EU countries, or in the spatial distribution of activity.

Owing to the implications for the signatory countries' economic policies and the convergence of their income levels, two conclusions present in some studies may be highlighted. First, certain papers note the tendency towards geographical concentration in labour-intensive industries, which have tended to be located in the southern European countries. That suggests that the differences in cost levels are a fundamental determinant of the localisation of these activities. Second, these papers indicate that the output of certain technology-intensive activities, which were initially concentrated in the most developed EU countries, has tended to be dispersed towards the peripheral countries. Considering these findings together, some authors conclude that the process of European integration has been conducive to the convergence in terms of income of the member countries, pointing to the southern and peripheral European countries as the main beneficiaries of this process, in that the output of the labour-intensive industries has tended to be concentrated in them. And at the same time, these countries have also absorbed part of the production of other more technology-intensive industries, which would formerly tend to be located in the

core countries [see, for instance, European Commission (1999)]. As will be seen, the findings of the present paper qualify to some extent the foregoing results.

3. PRODUCTIVE SPECIALISATION IN THE EU COUNTRIES

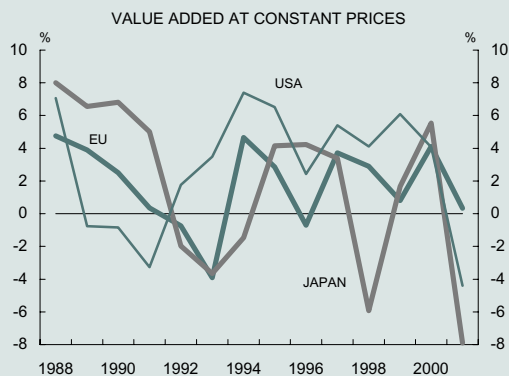
Detailed hereafter are some of the features that have characterised developments in the manufacturing sector in the EU as opposed to in its main competitors, the United States and Japan. In this connection, Chart 1 plots manufacturing value added and employment in the main industrialised economies. As can be seen, in recent years the European manufacturing sector has posted a moderate pace of growth compared with that in the United States. Moreover, this modest behaviour was reflected in employment, which shrank on average by close to 1% during these years. Manufacturing activity in Japan also grew at a low rate in this period, following its notable expansion during much of the eighties.

As Chart 2 reveals, the composition of European manufacturing production is characterised by the predominance of medium/high-technology industries, in addition to other traditional branches, while the higher-technology branches are of limited significance. That said, it should be recalled that the period analysed, having ended in 1998, excludes the phase in which the new information and communications technologies most expanded. Nonetheless, the changes observed during the 1988-1998 period reflect a slight shift in the productive structure towards the higher-technology branches, to the detriment of the so-called traditional activities. In any event, the industrial structure of the EU as a whole continues to be more geared towards branches with a lesser technological content, compared with the United States and Japan, with a perceptible lesser relative significance of industries that are more dynamic and with greater technological requirements. This pattern of specialisation may have contributed to explaining the very moderate behaviour of the European manufacturing sector in the period analysed, since traditional activities are characterised by their lesser dynamism and by the fact they are subject to greater competitive pressures from the recently industrialised countries, which have comparative advantages in terms of labour costs.

There follows a description of the main features and characteristics of productive specialisation in the EU countries. The aim is to determine which countries have seen the greatest changes in their industrial structures and whether these changes have tended to heighten or

CHART 1

Year-on-year growth rates in manufacturing



Source: AMECO.

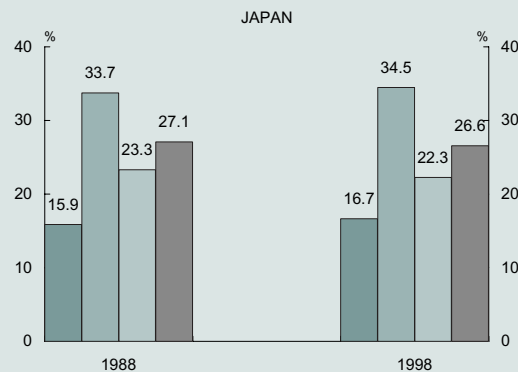
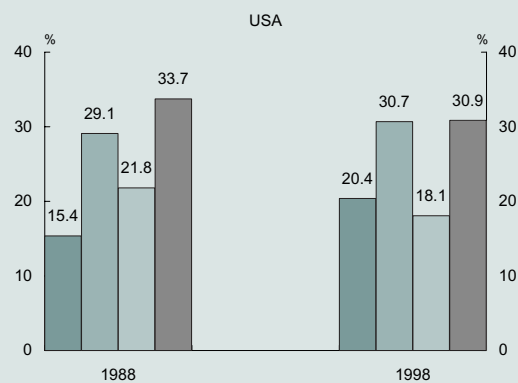
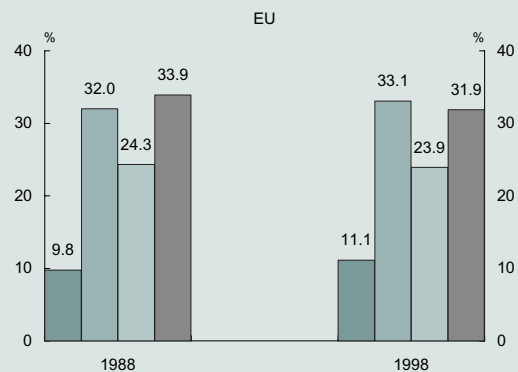
lessen the differences across the euro area. The principal changes in the spatial distribution of activity across these countries are also analysed.

Table 1 includes the results obtained on calculating the Gini index of relative specialisation for the average of the 1988-1998 period. As can be seen, Ireland, Greece, Finland and Denmark show, according to the information provided by this index, a greater degree of productive specialisation and, consequently, a structure more differentiated from the average (see also Chart 3). The Netherlands and Sweden also display high degrees of productive specialisation, albeit lower than the four above-mentioned countries. Germany, France, Italy, the United Kingdom and Spain have a low degree of specialisation, which would denote a substantial similarity of their productive structures in respect of the other EU members although, as will later be seen, the productive structures of this set of countries show differences of some importance.

Turning to the changes in these indices between 1988 and 1998, a slight increase in productive specialisation can be appreciated in most EU countries, with the exception of the

CHART 2

Structure of manufacturing production



Legend:
 HIGH (Dark Blue), MEDIUM-HIGH (Light Blue),
 MEDIUM-LOW (Medium Blue), LOW (Dark Grey)

Source: Banco de España, drawing on the Eurostat sbs_plus database.

Netherlands and Portugal, where significant declines are seen, and France. Nonetheless, the changes observed are generally on a very small scale and, indeed, only certain small EU economies – in particular, Ireland, Finland and Sweden – show a notable increase in specialisation. It may thus be concluded that existing disparities in EU countries' productive structures have tended to increase, albeit very moderately, in step with the results obtained in most of the studies conducted by other authors.

TABLE 1

Productive specialisation in the EU countries
(Gini index of relative specialisation) %

	1988	1998	Average for period	Change 98-88
Austria	0.326	0.330	0.317	0.004
Belgium	0.288	0.287	0.285	0.000
Germany	0.197	0.208	0.200	0.011
Denmark	0.481	0.494	0.477	0.013
Spain	0.240	0.258	0.240	0.018
Finland	0.441	0.557	0.483	0.116
France	0.205	0.193	0.197	-0.012
Greece	0.501	0.520	0.508	0.019
Ireland	0.583	0.633	0.577	0.051
Italy	0.211	0.247	0.234	0.036
Netherlands	0.412	0.383	0.387	-0.028
Portugal	0.457	0.417	0.446	-0.040
Sweden	0.352	0.417	0.377	0.066
United Kingdom	0.176	0.224	0.194	0.048
Weighted average (a)	0.238	0.259	0.244	0.021

Source: Banco de España, drawing on the Eurostat SBSPLUS database.

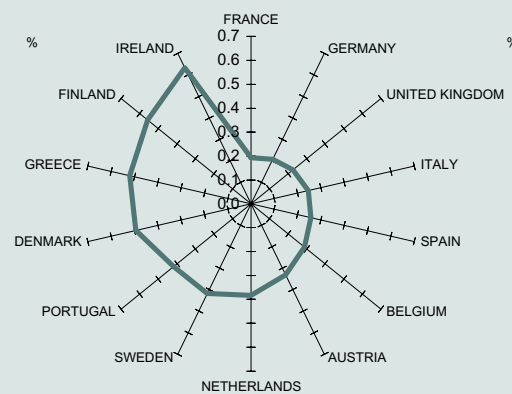
(a) Based on the weight of each country in total EU production.

So as to identify the changes underlying the increases and declines in specialisation inferred by the Gini indices, Chart 3 summarises the percentage breakdown of the production of the EU countries, and Chart 4 offers the main changes this structure underwent during the period considered (1988-1998). The increases in the specialisation of Ireland, Finland and Sweden have taken the form of a shift in their productive structures towards the more technology-intensive sectors, to the detriment of the low technology-intensive sectors. The case of Ireland merits special mention since, during the decade under analysis, its productive structure underwent far-reaching change. This transformation entailed a sizeable decline in the production of food, beverages and tobacco and growing specialisation in office supplies, computer equipment, chemicals and pharmaceuticals, industries which currently account for almost half of total manufacturing output (4). As a

(4) In this respect, it should be borne in mind that the production figures used in this paper are expressed at current prices. This could prompt some bias which might be particularly significant in the case of Irish production in the technology-intensive industries. That is because the strategy of the multinationals that dominate the production of these branches involves localising a large portion of profits in this country, setting low prices for the inputs from other subsidiaries resident abroad and high prices for the sales of companies headquartered in Ireland (namely, transfer pricing), given the tax benefits in place [see Murphy (2000)]. In any event, the increase in the production of these branches is on such a scale that it can hardly be accounted for in its entirety by this phenomenon.

CHART 3

Productive specialisation
Gini index



Source: Banco de España, drawing on the Eurostat sbs_plus database.

result of this specialisation process, Ireland's productive structure in 1998 showed a low degree of diversification and a marked gearing towards industries with greater technological requirements, while the production of the Scandinavian countries was polarised in certain low-technology and natural-resources-intensive activities, and in other industries with very high technological requirements.

The productive structures of the other countries do not show appreciable changes in the period analysed, in line with the results suggested by the specialisation indices. That said, there is a fairly generalised shift in production towards the high- and medium/high-technology industries, to the detriment of activities with lower technological requirements. In the case of the Spanish economy this shift is confined, on the information available to 1998, to the medium/high-technology sectors, with a notable increase in the share of the automobile industry.

In any event, among the countries making up this second group (where productive specialisation has scarcely changed), there are still substantial differences in productive structures. In particular, among the bigger economies, Spain and Italy show distinctive features that take the form of a lesser relative significance of the most technology-intensive industries and, at the same time, a greater participation by other traditional industries (especially textiles, clothing and footwear) compared with Germany, France and the United Kingdom. Greece and Portugal retain a very different productive structure from the other EU members, with a marked orientation towards more traditional activities, while the industries with greater technological

requirements account for a very low proportion of their production.

In sum, the findings obtained from the analysis of the manufacturing productive structure indicate that there were no major changes in the pattern of specialisation of the EU countries between 1988 and 1998. The most notable changes are evident in certain small economies, in particular Ireland, Finland and Sweden, which show growing specialisation in industries with greater technological requirements.

4. THE SPATIAL DISTRIBUTION OF ACTIVITY IN THE EU COUNTRIES

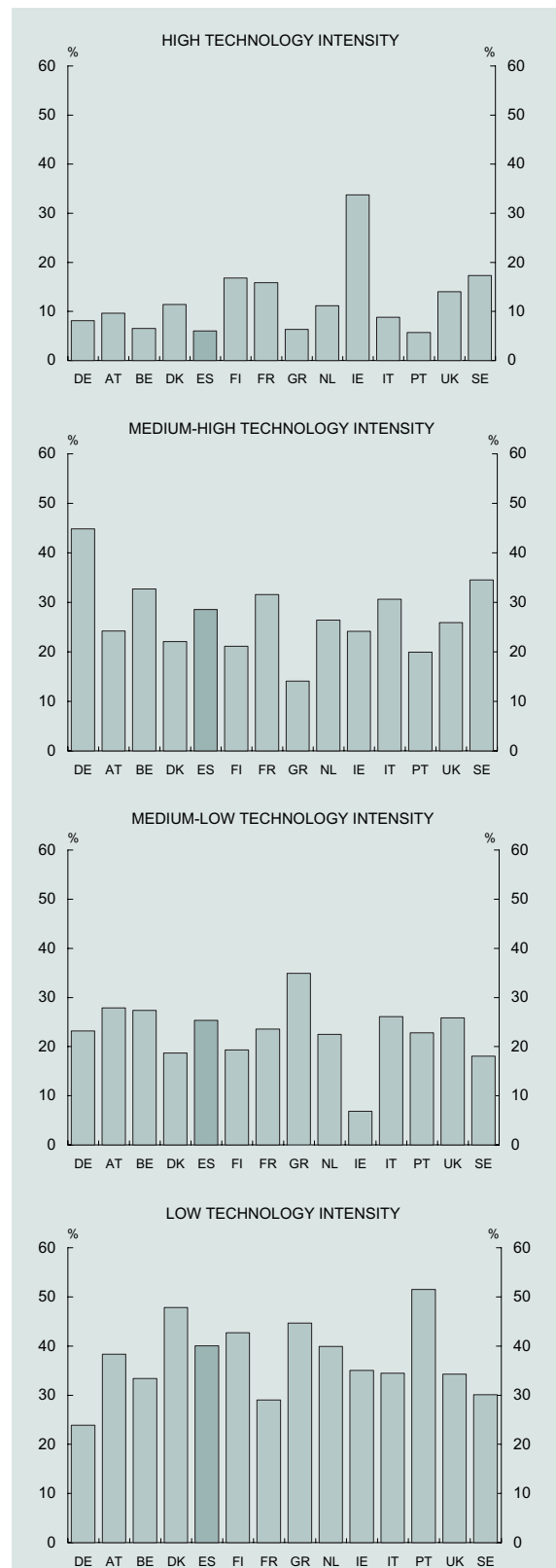
This section analyses the changes witnessed in the geographical distribution of manufacturing activity in the period from 1988 to 1998. It is attempted to determine which activities show a tendency towards spatial concentration and which are more dispersed. To this end, Table 2 shows the Gini index of absolute concentration for each division of the NACE at the two-digit level (5). The information provided by this index for the average of the period analysed would suggest that the industries with the greatest degree of spatial concentration are technology- and physical-capital-intensive. Particularly of note is the high degree of concentration in transport equipment, electrical equipment, machinery and mechanical equipment, optical and precision instruments, and office machinery and computers. The least technology-intensive sectors generally show a greater spatial dispersion of their production, which is particularly significant in the case of food. However, there are certain exceptions among the latter industries such as tobacco, and textiles, clothing and footwear, which evidence very high spatial concentration.

Bearing in mind the changes recorded by the Gini index, during the period 1988-1998 mention may be made of the increase, among the least technology-intensive industries, in the degree of geographical concentration in the clothing and footwear industry. Conversely, the spatial dispersion of all technology-intensive industries increased during the period.

For a clearer analysis of the changes in the degree of concentration of the various industries, Chart 6 presents the Gini index, of absolute concentration, both for manufacturing industry as a whole and for the different branches

(5) The values of the Gini index for each division of the NACE at the two-digit level are constructed via a weighted average of the results obtained under the three-digit breakdown.

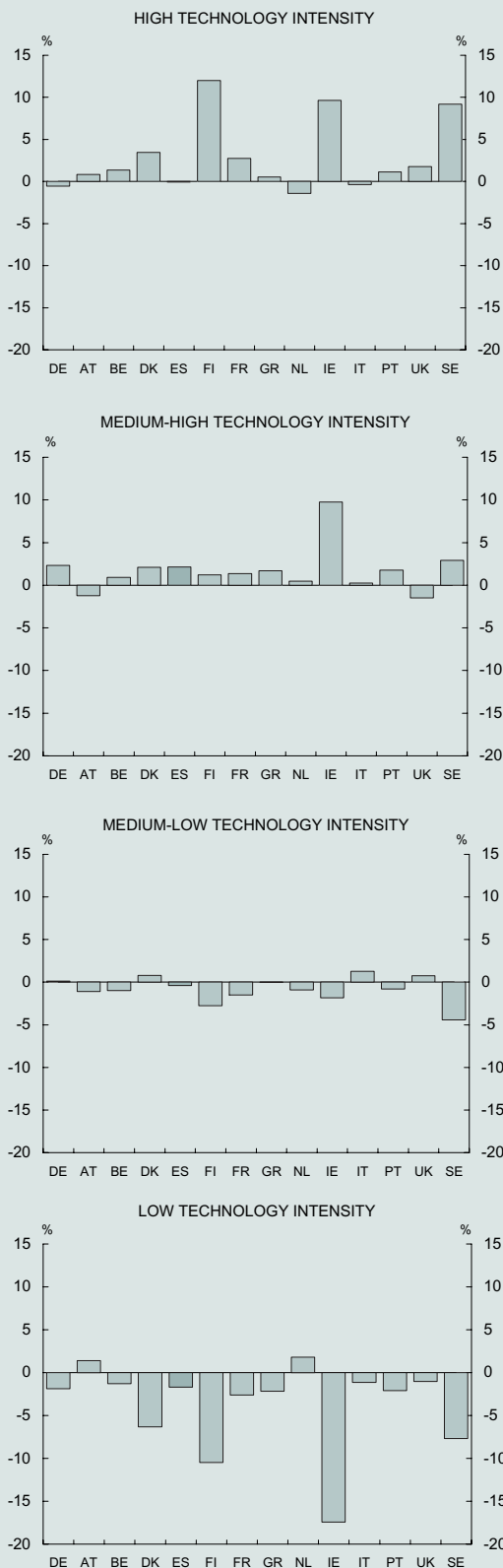
CHART 4
Structure of the manufacturing production of the EU countries in 1998



Source: Banco de España, drawing on Eurostat sbs_plus database.

CHART 5

Changes in the manufacturing production structure of the EU countries (1998-1988)



Source: Banco de España, drawing on the Eurostat sbs_plus database.

TABLE 2

Productive concentration by branch of activity. Absolute Gini index

	Average for the period	Change 98-88
15. Food and beverages	0.491	0.019
16. Tobacco	0.647	0.024
17. Textiles	0.578	0.006
18. Clothing	0.592	0.031
19. Footwear	0.671	0.053
20. Wood	0.510	0.002
21. Paper	0.528	0.002
22. Printing and publishing	0.530	-0.028
23. Oil refining and coke	0.560	0.044
24. Chemicals	0.574	-0.025
25. Rubber and plastic	0.594	-0.007
26. Other non-metallic mineral	0.566	-0.001
27. Basic metals	0.544	0.009
28. Fabricated metal products	0.581	-0.032
29. Machinery and equipment	0.638	-0.013
30. Office machinery and computers	0.624	0.012
31. Electrical equipment	0.669	-0.022
32. Electronic equipment	0.568	-0.056
33. Optical and precision instruments	0.640	-0.027
34. Transport equipment	0.668	0.011
35. Other transport equipment	0.645	0.025
36. Sundry manufactures	0.574	-0.019
Total (a)	0.583	-0.001

Source: Banco de España, drawing on the Eurostat SBSPLUS database.

(a) Obtained as the average of the indices of each branch, weighted by its share in total for manufacturing.

or sectors classified by their technological intensity. As can be seen, the degree of concentration of European industry at the aggregate level has not undergone major changes since the late eighties, with a mildly increasing trend discernible until 1993, which tended to be reversed in subsequent years. Nonetheless, analysis of the behaviour of the different industries reveals changes on a greater scale, most notably the tendency of the most technology-intensive industries towards geographical dispersion. Conversely, the spatial concentration of the medium-technology industries in the late eighties and early nineties increased, although this behaviour tended subsequently to stabilise or even be reversed in medium/high-technology branches. Finally, the degree of concentration of the low-technology industries remained stable during these years.

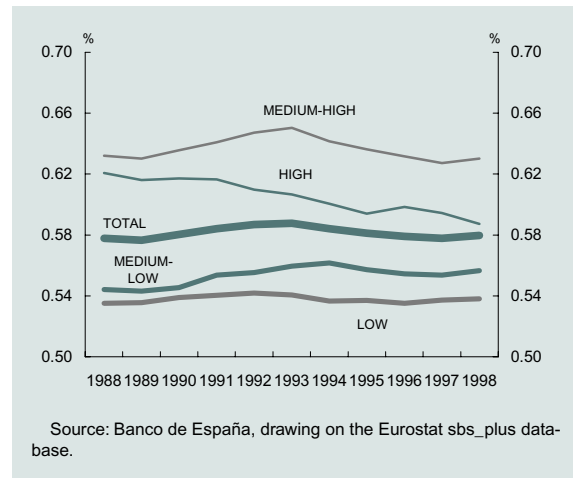
Described hereafter are the changes in the distribution of manufacturing activity across the

EU countries that underlie the results obtained with the Gini concentration indices. In this connection, Table 3 presents the distribution by country of the production of the various branches in the years 1988 and 1998. As the table shows, the apparent tendency towards greater geographical dispersion in high-technology-intensive industries throughout the period reflects a most significant reduction in Germany's production share (and, to a lesser extent, that of Italy). Indeed, Germany has relinquished its leadership in respect of the production of these industries to the French economy. In these industries, certain small economies such as Ireland, Finland and Sweden have managed to increase their presence most notably, displacing some of the major producers (6). Also, the share of the EU countries with lower per capita income in the most technology-intensive industries has not changed greatly but has held at very low levels, especially if this weight is compared with their share in the total EU population or with the relative significance of the production of these countries in other less technology-intensive industries.

In the remaining industries the changes are more moderate, in keeping with the results of the Gini concentration indices, although something of an increase in the share of Spain, Portugal and Ireland can be seen. However, the changes in the geographical distribution of production in textiles, clothing and footwear merit comment since, as earlier mentioned, this is one of the industries where the degree of geographical concentration most increased. This finding mostly reflects an increase in the share of the main producer, Italy, which climbed from 27.8% in 1988 to 33.8% in 1998, although a slight increase in the production share of Spain and Portugal is also discernible. The increase in the degree of geographical concentration in this type of labour-intensive industry appears to suggest that differences in relative costs of very telling when it comes to explaining productive specialisation and the location of these activities. However, the fact that the biggest increases in production shares in these industries should have been absorbed by Italy (a country with comparatively higher wage and income levels) suggests that other factors such as

(6) Surprisingly, those countries which have notably increased their share in the production of the technology-intensive industries, i.e. Ireland, Finland and Sweden, have scarcely seen their share in total EU manufacturing production increase. In this respect, it should be recalled that the production figures used are expressed at current prices, which might add some bias to the share of these countries in total manufacturing production, since they have specialised in the manufacture of technology-intensive products whose relative prices have fallen significantly in recent years compared with other products.

CHART 6
Changes in the degree of absolute concentration of production (Gini index)



product differentiation, whether in design or quality, play an important role in the location of these industries.

5. CONCLUSIONS

Changes in the productive specialisation of the EU countries reflect the absence of any major transformation of their productive structures in the period running from 1988 to 1998. Only certain small economies, in particular Ireland, Finland and Sweden, have altered their productive structure during this period. They have widened the differences from her EU partners by specialising most intensively in industries with greater technological requirements. Nor can drastic changes in the geographical concentration of production of European manufacturing output be discerned. Nevertheless, Ireland, Finland and Sweden can be seen to be more significant in terms of the production of the most technology-intensive industries, to the detriment of certain core economies and, especially, of Germany.

The growing specialisation and localisation of the highest technology activities in the Scandinavian countries is no doubt associated with highly skilled labour and with the capacity for innovation and adaptation to the new technologies that these countries have shown in recent decades, although the time during which the dynamism of the new technology industries peaked lies outside the period studied. In Ireland, productive repositioning towards the most technologically intensive industries is most closely linked to the presence of large multinationals. These have tended to

TABLE 3

Geographical distribution of manufacturing production in the EU

%

	Total		High technology		Medium-high technology		Medium-low technology		Low technology	
	1988	1998	1988	1998	1988	1998	1988	1998	1988	1998
Germany	27.6	27.4	24.4	20.0	36.6	37.2	26.1	26.5	21.0	20.5
Austria	2.3	2.2	2.0	1.9	1.8	1.6	2.7	2.6	2.5	2.7
Belgium-Luxembourg	4.6	4.2	2.4	2.5	4.6	4.2	5.4	4.9	4.7	4.4
Denmark	1.4	1.5	1.1	1.5	0.9	1.0	1.0	1.1	2.2	2.2
Spain	7.1	7.5	4.4	4.1	5.8	6.5	7.4	7.9	8.7	9.4
Finland	2.0	1.9	1.0	2.8	1.3	1.2	1.9	1.5	3.2	2.5
France	15.8	15.9	21.2	22.7	14.9	15.2	16.2	15.7	14.7	14.5
Greece	0.6	0.5	0.4	0.3	0.2	0.2	0.9	0.8	0.8	0.8
Netherlands	3.9	3.8	5.0	3.8	3.1	3.1	3.7	3.6	4.4	4.8
Ireland	0.9	1.7	2.3	5.1	0.4	1.2	0.3	0.5	1.4	1.8
Italy	14.3	14.0	13.4	11.1	13.5	13.0	14.5	15.3	15.0	15.2
Portugal	1.4	1.6	0.6	0.8	0.8	1.0	1.3	1.5	2.2	2.6
United Kingdom	15.1	14.6	19.0	18.5	12.9	11.5	15.6	15.8	15.7	15.7
Sweden	3.2	3.1	2.7	4.9	3.2	3.3	3.0	2.4	3.6	3.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Big four (a)	72.7	72.0	78.1	72.3	77.9	76.8	72.4	73.2	66.4	65.9
Rest	27.3	28.0	21.9	27.7	22.1	23.2	27.6	26.8	33.6	34.1

Source: Banco de España, drawing on the Eurostat SBSPLUS database.
(a) Germany, France, Italy and United Kingdom.

concentrate most of their investment in this country, despite its peripheral position, seeing it as an export platform to the other European markets, in a setting in which its main comparative advantage at the time of EU accession lay in its lower labour costs. Ireland's language and cultural links with the United States, its highly skilled human capital and the tax and financial incentives for foreign investment help explain this phenomenon.

In any event, although the diagnosis of the factors behind this pattern of localisation requires a more in-depth analysis than that offered in this article, the Irish experience suggests that if the appropriate conditions to attract new companies are set in place (including most notably the development of a highly skilled stock of human capital allowing rapid adoption of and adaptation to new technologies), economic integration need not bring about a polarisation of production between a rich and industrialised centre and a periphery where the low-value-added activities are concentrated.

As regards the Spanish economy, the changes seen in its productive structure show a progressive shift towards medium/high-technology industries which, in general, offer greater growth potential and fewer pressures vis-à-vis the recently industrialised economies, to

the detriment of activities of the lesser technological requirements. In this way, the basic features of the Spanish productive structure are highly similar to those of the major EU economies. However, the most technology-intensive industries are still very small-scale compared to other EU countries, and in the latter years of the period studied significant changes have still not been observed in Spain's presence in the European output of these types of industries, in contrast to what has occurred in other peripheral countries.

It may be inferred from the foregoing characteristics that the process of specialisation and localisation of European activity does not appear to corroborate the conventional theory of trade. This theory suggests that integration may ultimately increase disparities in the productive structures of the EU countries, as it is conducive to the concentration of labour-intensive activities in the peripheral and southern European countries. Activities with greater technological requirements, meanwhile, would be located in the core countries, which would have a better starting position in terms of human capital skills and technological know-how.

The increase in the share of certain peripheral countries in the production of the most technology-intensive industries runs counter to

the conclusions of certain industrial localisation models. The latter suggested that advances in integration could prompt a concentration of such activities (with a greater presence of economies of scale, susceptible to generating technological externalities that are skilled-labour-intensive and with strong industrial links) in the core countries, which have broader markets and a more developed industrial apparatus. In this respect, the persistence of certain obstacles (language and cultural barriers in the main) potentially restraining cross-country labour mobility might help explain the absence of a tendency towards spatial concentration, contrary to what has been seen in the United States.

Apparently, then, in most EU countries intra-industry specialisation has predominated. This has not required major changes in productive structures or in the geographical distribution of activity. Some caution is needed, however, when extending these conclusions to other integration episodes and, in particular, to the changes potentially arising from the full operation of Economic and Monetary Union and, above all, to the consequences of the future EU enlargement to the central and eastern European countries, since they include countries with a high degree of heterogeneity compared with the productive structures and factor endowment of the current Member States.

12.12.2002.

REFERENCES

- AMITI, M. (1999). "Specialization patterns in Europe", *Weltwirtschaftliches Archiv*, 135 (4), pp. 573-593.
- BALDWIN, R. E. and VENABLES, A. J. (1995). "Regional Economic Integration", in Grossman, G. y Rogoff, K. (eds.). *Handbook of International Economics*, vol. III.
- BRÜLHART, M. (2001). "Evolving geographical concentration of European manufacturing industries", *Weltwirtschaftliches Archiv*, 137 (2), pp. 215-243.
- EUROPEAN COMMISSION (1999). *The competitiveness of European Industry: 1999 Report*, Working Document of the Services of the European Commission.
- FUJITA, M., KRUGMAN, P. and VENABLES, A. J. (1999). *The spatial economy: cities, regions and international trade*, MIT Press, Cambridge.
- KRUGMAN, P. (1979). "Increasing returns, monopolistic competition and international trade", *Journal of International Economics*, 9, pp. 469-479.
- (1991). *Geography and trade*, Leuven University Press.
- MIDELFART-KNARVIK, K., OVERMAN, H., REDDING, S. and VENABLES, A. (2000a). "The location of European Industry", European Commission, *Economic Papers*, 142.
- MURPHY, A. (2000). "The Celtic tiger: an analysis of Ireland's economic growth performance", European University Institute, Working Paper no. 16.
- OECD (2001). "OECD Science, Technology and Industry Scoreboard: Towards a Knowledge-based economy", OECD, Paris.
- OTTAVIANO, G. and PUGA, D. (1997). "Agglomeration in the global economy: a survey of the 'New Economic Geography'", Centre for Economic Policy Research, Discussion Paper 1699.
- PUGA, D. (1999). "The rise and fall of regional inequalities", *European Economic Review*, 43 (2), pp. 303-334.
- VENABLES, A. J. (1996). "Equilibrium locations of vertically linked industries", *International Economic Review*, 37 (2), pp. 341-359.