EVOLVING GEOGRAPHICAL SPECIALISATION OF EUROPEAN MANUFACTURING INDUSTRIES

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March 2000

6,700 words

Abstract:

This paper analyses the geographical specialisation of 32 manufacturing sectors over the 1972-1996 period, based on annual employment and export data for 13 European countries. Specialisation has increased continuously over the sample period in employment terms, while remaining roughly unchanged in export terms. On average, increases in specialisation were stronger prior to the launch of the Single Market than afterwards. The sectors most sensitive to the Single Market, however, showed an acceleration in specialisation after 1986. There is also evidence that low-tech industries are the most strongly specialised, and that centre-periphery gradients across countries are losing importance for industrial location in the EU.

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I.   INTRODUCTION

As product-market and factor-market barriers are reduced, market forces inevitably produce a re-organisation of economic activities and employment across geographical space. This issue is one of the key concerns of policy makers as economic frontiers continue to crumble in a globalising economy. International integration has progressed furthest among the countries of the European Union, and questions about patterns, trends and implications of sectoral specialisation therefore loom particularly large on the European policy stage. Is ongoing integration unleashing agglomeration forces and thereby increasing economic disparities between central and peripheral regions? Will the spatial distribution of European industry come to look ever more like the regionally clustered geography that is typical of the United States?

Recent theoretical work in economic geography emphasises sectoral agglomeration economies which deploy their full force as trade barriers are reduced. Large-scale locational shifts that might in such a scenario be unleashed by economic integration could clearly have profound implications. Moreover, the empirical scrutiny of locational patterns in the EU is much more than the object of academic curiosity. Locational trends and their determinants are of direct relevance to workers in all parts of the EU, particularly to those whose occupational and geographical mobility is limited. They also matter for virtually all aspects of EU policy: the distribution of regional funds, technology and industrial policy, direct and indirect taxation, and transport policy, to name but the most obvious. Even the Common Agricultural Policy (through the Guidance Fund) and the monetary policy of the European Central Bank (in terms of absorbing industry-specific shocks) are affected.

Nevertheless, our knowledge about the existence of specialisation patterns and agglomeration phenomena in Europe is still limited. In particular, there exists no disaggregated and comprehensive investigation of how the EU's economic landscape has evolved over time, especially during the recent period which saw the implementation of the Single Market. This paper is a contribution towards closing this gap. We examine the patterns of sectoral specialisation in European manufacturing. The aim is to document the broad specialisation trends in Western Europe since the 1970s, to evaluate the impact on those specialisation patterns of the Single Market programme as well as certain industry

characteristics, and to distil some conjectures on likely future developments. Sectoral specialisation patterns are described in a consistent fashion across 32 manufacturing sectors for the 1972-1996 period, based on employment and export data for 14 countries.

The paper is organised as follows. Section 2 reviews the relevant theoretical and empirical literature. Measurement and data issues are discussed in Section 3. In Section 4, we document the evolution of specialisation patterns using employment and export data. Section 5 looks at centre-periphery gradients in specialisation for each industry. Section 6 seeks evidence on the determinants of observed specialisation trends, though sector-level grouped analysis. Section 7 concludes.

II. RELATED LITERATURE: THEORY AND EMPIRICS OF INTERNATIONAL SPECIALISATION

Theory of Industry Location and Trade

Ohlin (1933) famously stated that "the theory of international trade is only a part of a general localisation theory". Nevertheless, there has been remarkably little cross-fertilisation between location theory and trade theory until the recent development of trade models with a spatial dimension, labelled the "new economic geography". However, even "dimensionless" neoclassical models, at least in some variants, imply locational predictions that can be interpreted in a spatial sense. It is impossible to do justice to a vast body of theoretical thinking in a short summary.[1] At the risk of oversimplification, we resort to a three-way categorisation of relevant intellectual contributions, which can give some structure to our empirical findings.

The distinguishing features of the three schools are as follows.

1.   *Neo-classical models* are characterised by perfect competition, homogeneous products and non-increasing returns to scale. Location is determined exogenously, by what Krugman (1993) has termed "first nature": given spatial distributions of natural endowments, technologies and/or factors. Economic activity is spread or concentrated over space according to the spread or concentration of these underlying features. The

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[1] For a comprehensive survey of recent theoretical advances, see Fujita, Krugman and Venables (1999).

dominating location pattern is inter-industry specialisation: activities settle in locations with a matching comparative advantage. In this framework, and assuming zero trade costs, the spatial distribution of demand affects the pattern of trade, but not the location of production. If, realistically, trade costs are assumed, and if demand is more evenly spread over space than endowments, then higher trade costs will entail greater locational dispersion of activity. At the limit, prohibitive trade costs induce perfect dispersion of ("non-traded") industries following the geographical distribution of demand.

2. Models of the *new trade theory* dispense with all exogenous, "first nature" spatial elements bar one: market size. Market size is determined primarily by the size of the labour force in a particular country, and labour is immobile across countries. These models introduce activity-specific features ("second nature") such as increasing returns, differentiated products and imperfect competition. The typical outcome has two layers. First, there is inter-industry specialisation, with sectors clustering in locations which offer best access to product markets. Second, there is intra-industry specialisation across firms, each of which produces a unique, horizontally differentiated variety of the industry's product. As long as some firms are left in the smaller market, intra-industry trade will ensue. As trade costs fall towards zero, however, all increasing-returns activity will tend to concentrate near the core market, and intra-industry trade between the core and the periphery vanishes.

3. In *new economic geography* models, location becomes entirely endogenous: "second nature" determines everything. As production factors and/or firms are mobile, even market size is explained within the model. The analytical starting point is normally a featureless one- or two-dimensional locus with uniformly distributed labour and output of a single industry. This distribution tends to be unstable, due to the assumed "second nature" characteristics of the economy, such as market-size externalities and input-output linkages. Such characteristics can produce self-reinforcing agglomeration processes. Hence, a disturbance to the initial "symmetric" distribution can set the economy on a path towards a new locational equilibrium. There are many possible and locally stable equilibria. Which one is attained depends on the starting distribution, on the nature of the disturbance and on various industry characteristics. In these models, agglomeration mechanisms can meet opposing forces, generally in the form of increases in the prices of immobile factors. Pronounced agglomeration and the resulting centre-periphery structure is therefore just one of several possible outcomes. A typical result is that agglomeration relates non-

monotonically to economic integration: the economy becomes most spatially polarised at intermediate trade costs.

Analytical Empirics

There are two fundamental ways of testing these economic theories. The first approach is to evaluate the real-world relevance of economic *mechanisms* underlying each theoretical model. For instance, one could try to assess which type of market structure is a more appropriate description of conditions in particular economic sectors: perfect competition as in neo-classical theory or monopolistic competition as in the new theories. This is in principle the most compelling approach. However, it relies to a very large extent on qualitative information. Firm numbers or estimates of cost functions, for example, are very poor proxies for the type of market structure in a sector. Similarly, the existence of locational externalities is notoriously difficult to measure.

The overwhelming majority of empirical studies has therefore employed the second approach to testing trade and location theory: a comparison of predicted and observed *outcomes*. In so far as competing theories produce crisply differing predictions, they should be easily separable in the data. Unfortunately, the outcomes predicted by various strands of location theory are often neither crisp nor different. The obvious example is the new economic geography: multiple equilibria and path dependency are intrinsic features of these models. In effect this means that new economic geography models can predict a wide range of outcomes which may well look like those generated by other theories. Another example is the existence of intra-industry trade (IIT), the simultaneous importing and exporting of goods with similar production requirements. IIT is generally deemed incompatible with neo-classical theories, but consistent with the new trade theory. However, the central model of the new trade theory, Krugman (1980), predicts that, as trade barriers are reduced, increasing-returns industry concentrates in the large market. The share of intra-industry trade should therefore tend to zero with economic integration. Great care clearly needs to be taken in interpreting empirical findings as corroboration or rejection of theoretical models.

A number of studies have nevertheless developed statistical tests of neo-classical versus new models. The pioneers were Davis and Weinstein (1996). They argued that the "home

market effect" can be used as a discriminating criterion. In neoclassical models the relationship between demand and production idiosyncrasies will be one-to-one at most, and relatively high demand share for a good in a particular country will lead to net imports of that good. In models with increasing returns to scale and monopolistic competition, however, the relationship between demand and production idiosyncrasies is more than one-to-one: comparatively high demand shares for certain increasing-returns goods will attract a more than proportional share of production and give rise to net exports of those goods. Davis and Weinstein have operationalised the market-size test econometrically and found varying empirical support for the new paradigms, depending on the specification and data sets used. In an application of this discriminating criterion on OECD data, Lundbäck and Torstensson (1998) have found support for the "new" models. However, several authors have extended the original Davis-Weinstein setup and found the discriminating criterion to be fragile to the relaxation of various restrictions imposed on the models (Davis, 1998; Feenstra, Markusen and Rose, 1999; Head and Ries, 1999; Brülhart and Trionfetti, 2000).

In conclusion, while much progress has been made in devising empirical tests of the competing theoretical paradigms, there remains considerable scope for devising and applying robust separation criteria. It is not surprising, therefore, that the bulk of the empirical literature consists of descriptive papers, which seek to extract general patterns and salient features from the data, and which look for stylised facts that might or might not be consistent with theoretical predictions rather than for rigorous tests of competing models.[2]

Descriptive Empirics

The majority of empirical papers dealing with location at an international level are based on *trade data*. Many of these analyses are concerned with the pattern of trade flows *per se*, but most of them draw on trade data as an indicator of specialisation patterns in production. Yet, trade statistics only yield approximate measures of specialisation; it is through employment or output data that location patterns can be quantified directly. The popularity of trade data stems, of course, from the fact that they are so widely available, relatively reliable and highly disaggregated. Therefore, exports are often used as a proxy for

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[2] Considering the difficulty of separating theoretical paradigms in the data, Leamer and Levinsohn (1995) have issued the following simple advice to empirical researchers. "estimate, don't test".

production, with the implicit assumption that export propensities are similar across countries and sectors.

Trade data have mainly been used as the basis for the calculation of IIT indices. Since this type of trade has been deemed incompatible with neoclassical models, it is often interpreted as a *prima facie* indicator of the relative importance of increasing returns and imperfect competition. According to this interpretation, the new theories appear to be increasingly relevant in explaining international specialisation patterns, while neo-classical determinants seem to be gradually losing importance. The reason is that IIT shares have shown a secular rise throughout the post-war years in most countries. This is true for the EU (Fontagné, Freudenberg and Péridi, 1997; Brülhart and Elliott, 1998) as well as for the industrialised countries world-wide (OECD, 1994).

Trade statistics are easy to come by and tend to be highly disaggregated across industries. However, they must be considered a second-best indicator of locational patterns. An uninitiated commentator would surely opt for employment, output or value-added data as the correct gauge of specialisation. In addition, trade data are only available for countries, and not at the level of regions. Therefore, empirical researchers have recently made significant efforts to gauge specialisation patterns on the basis of *production data*. Indeed, the resurgence of interest in economic geography is partly due to observations on regional production statistics for the United States: many industries are concentrated in small areas without "obvious" reasons to do with exogenous resource endowments (Krugman, 1991b) or with the large size of average production plants in some sectors (Ellison and Glaeser, 1997). In comparing production specialisation on either side of the Atlantic, it was found that the European Union still has a more dispersed, less specialised industrial geography than the United States (Krugman, 1991b) even though the post-war trend in the U.S. has been towards decreasing specialisation (Kim, 1995; Krugman, 1991b) whilst there have been some indications of increasing specialisation of production in EU countries (Brülhart, 1998; Amiti, 1999).

However, we still do not avail of a consistent and comprehensive description of specialisation trends in the EU. There is an evident contradiction between the specialisation results based on trade data, which show rising IIT, and those based on

production data, which suggest increasing specialisation.[3] Furthermore, studies using production data by Helg, Manasse, Monocelli and Ravelli (1995) and by De Nardis, Goglio and Malgarini (1996) suggest that the number of dispersing sectors roughly equalled that of concentrating sectors in the EU during the 1980s. One cannot, therefore, conclusively accept as a stylised empirical fact that EU industry has become more localised in recent years.

Since locational determinants differ across industries, specialisation trends will also vary across industries. Redding (1999) has shown that there is considerable mobility in the cross-sectoral distributions of countries' output shares. Hence, inconspicuous aggregate results might obscure pronounced patterns in certain types of sectors. Using intra-EU trade data, IIT in the resource-intensive and scale-intensive sectors is found to be significantly below the overall average (Brülhart, 1998). In addition, production data indicate that scale-sensitive industries are localised at the EU core and that labour-intensive industries are relatively dispersed. These findings are loosely supportive of theoretical priors (if it is assumed that labour-intensive sectors consist of differentiated goods, and hence generate IIT). It is also found in Brülhart (1998) that the strongest recent localisation trends appear in industries tagged as labour intensive, which appear to be concentrating in peripheral EU regions. That study therefore suggests that factor-cost considerations are likely to dominate increasing returns as the main locational determinant of impending specialisation trends in Europe. This conclusion mirrors that of Kim (1995), whereby the recent theoretical emphasis on plant-level increasing returns might not capture the main locational forces of our time.

III.   MEASUREMENT AND DATA

The Locational Gini Index

The results of this paper rest on locational Gini indices for each industry-year observation. This index reports the share of an area between the Lorenz curve and the 45-degree line. It ranges from zero to one and relates positively to specialisation. An illustrative example is given in Figure 1. The cumulative shares of countries' 1996 employment in the car

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[3] Those opposing trends in export and output specialisation have also been detected by Ruhashyankiko (2000) in a manufacturing dataset for 160 countries over the 1970-1992 period.

industry are measured on the vertical axis, while the cumulative shares of countries'
employment in total manufacturing are reported along the horizontal axis. The horizontal
ordering of countries is crucial. In terms of Figure 1, countries are lined up so that the
slope of the Lorenz curve, which links all country observations, increases continuously as
one moves away from the origin. This ordering can be neatly described with reference to
the Hoover-Balassa index of "revealed comparative advantage":

$$BALASSA_{ict} = (\frac{\frac{E_{ic}}{\sum\limits_{c} E_{ic}}}{\frac{\sum\limits_{i} E_{ic}}{\sum\limits_{i}\sum\limits_{c} E_{ic}}})_t \,, \tag{1}$$

where E stands for employment (or exports, output etc.); and the subscripts i, c, t denote
industries, countries and years respectively. This measure takes values between zero and
infinity and relates positively to a country's specialisation in the particular industry. In a
locational Lorenz diagram of specialisation by industry countries are lined up in increasing
order of their Balassa index. Hence, Figure 1 shows that, or our sample countries in 1996,
Greece was the least (and Sweden the most) specialised in terms of their employment
shares in car manufacturing. The Gini index, by measuring the area between the 45-degree
line and the Lorenz curve, therefore also amounts to a measure of dispersion of Balassa
indices. If all countries dedicated an equal proportion of their manufacturing workforce to
the car industry, their Balassa indices would all equal one, the Lorenz curve would
coincide with the 45-degree line, and specialisation as measured through the locational
Gini coefficient would be zero. On the other hand, the greater the variation across countries
in their labour shares devoted to car manufacturing, the greater will be the dispersion of
Balassa indices, the stronger will be the curvature of the Lorenz curve, and the higher will
be specialisation as measured by the Gini coefficient. A helpful discussion of the properties
of the Gini index in the context of international specialisation can be found in Amiti
(1999), and Cowell (2000) gives a thorough appraisal of the coefficient's usefulness as a
measure of inequality.

A Measure of Centrality

The study of industry location is not only about the degree of geographical concentration,
as measured by Gini indices, but also about the place where such concentration occurs. In

particular, both theory and policy considerations suggest a concern for the centre-periphery dimension. The question is: is sector *X* clustering at an economic "core" location, is it concentrated at the "periphery", or does its specialisation pattern bear no systematic relationship to the centre-periphery dimension? Core and periphery are defined by their relative market access. In the spirit of the Harris (1954) "market potential" concept, we have computed the following centrality measure:

$$CENTRAL_{ct} = \frac{1}{N} * ([\sum_d \frac{\sum_i E_{id}}{d_{cd}}] + \frac{\sum_i E_{ic}}{d_{cc}})_t, \; c \neq d \quad , \tag{2}$$

where *c* and *d* denote countries, *N* is the number of countries in the sample, and d stands for geographical distance. This definition takes account of each country's own economic size and area as well as of its distance from other markets (in terms of employment). Bilateral distances d_{cd} are defined as the distances between capital cities. Intra-country distances d_{cc} are computed following Leamer (1997) as one third of the radius of a circle with the same are as the country in question, i.e. $d_{cc} = ([Area_c / p]^{0.5}) / 3$.

Having constructed centrality indices for each country and year, locational centre-periphery gradients can be calculated as the correlation coefficient within each industry between *BALASSA* and *CENTRAL*.

The STAN Database

Turning to the selection of appropriate data, employment is probably the most directly policy relevant and intuitive measure of the size of an industrial sector. The first part of this analysis therefore draws on payroll data. Traditionally, however, the study of international specialisation patterns has drawn mainly on trade data. This study therefore also uses export data in order to facilitate comparability with other studies. In particular, the juxtaposition of employment and trade specialisation measures should shed some light on the apparent contradiction between increasing specialisation trends previously observed in production data and decreasing specialisation trends suggested by the analysis of international trade statistics.

The analysis draws on the OECD's STAN database, which provides a balanced panel of annual employment figures for 32 ISIC manufacturing sectors (two- to four-digit) covering

the period 1972-1996 and 13 European countries. We thereby have a data set that covers the most important phases of EU market integration, starting with the 1973 enlargement and culminating in the completion of the Single Market in 1992. The EU-15 countries not included in that database are Ireland and Luxembourg, and Belgium had to be omitted due to insufficient data coverage. On the other hand, our analysis considers data for Norway, which, albeit not a full member of the EU, has enjoyed effectively free access to the EU market in most manufacturing goods since 1973 (WTO, 1995).

The latest edition of the STAN database (OECD, 1999) provides a full set of export data for the period of our investigation. On the employment side, however, some gaps remain. Two changes have been made in order to obtain a balanced panel. First, some sectors with patchy coverage at the disaggregated level were amalgamated. They can be identified in Table 1, since the last digit of their ISIC code was set as "X". Second, the gaps that remained were filled using extrapolation of trends based on contemporaneous output, value added and/or export data. This was used for a significant part of 1995, and most of 1996, data, as well as for Spain, 1972-77. Note that the filling-in of 1995 and 1996 values likely biases observed specialisation in favour of a continuation of previous trends, so that these results should be interpreted with greater caution than those for earlier years.

IV. INDUSTRY-LEVEL SPECIALISATION PATTERNS IN EUROPEAN MANUFACTURING

Specialisation Across Sectors

The starting point of this analysis is to compare industry-level Gini coefficients at the beginning and end of our sample period, in 1972 and 1996. Table 1 reports these results for both employment and export data. We find that, on average, specialisation is more pronounced in the trade data than in employment terms. This finding is consistent with incomplete specialisation in a comparative-advantage world and homogeneous products. This result could also point to the existence of non-traded goods in heterogeneous sectors, which could be the result of prohibitive trade costs or of home bias in expenditure. Given the relatively high level of aggregation in our data, the second interpretation looks particularly plausible.

Export and employment specialisation patterns, though dissimilar, are correlated. The rank correlations between export and employment Ginis across the 32 industries in Table 1 are 0.34 (P=5.8%) in 1972, and 0.43 in (P=1.3%) 1996. It is striking that we find two "low-tech" sectors at the top end of the specialisation ranking in both export and employment terms: *footwear* (ISIC 3240) and *tobacco* (3140). This replicates in European data Krugman's (1991b) finding that the most geographically concentrated industries in the US are not technology- and scale-intensive industries, but some traditional sectors such as leather goods and textiles. One might be similarly surprised to find *electrical apparatus* (383X) and *plastic products* (3560) at the bottom of both our specialisation rankings in Table 1. However, we probably have to take this finding as a confirmation of another of Krugman's (1991b) stylised results: more "modern" industrial activities are often amalgamated into obsolete statistical headings, and as a consequence estimated specialisation measures are biased downward. Both the *electrical apparatus* and *plastic products* headings in our ISIC classification comprise very heterogeneous bundles of goods, and the industry Ginis might well mask starker specialisation patterns at sub-industry level. Absolute levels of the Gini coefficients will therefore have to be treated with some caution. Fortunately, this statistical aggregation problem does not afflict an examination of specialisation patterns over time, to which we turn below.

It is interesting at this stage to discuss some cases of sectors for which trade and employment Ginis tell conflicting stories. For instance, *petroleum and coal products* (ISIC 35XX) and *food products* (3110) have among the highest Ginis in export terms and among the lowest in employment terms. These seem to be plausible examples of sectors with a large non-traded element, due to trade costs and to home-biased demand. It is more difficult to speculate about the reasons why we observe the opposite configuration for *professional and scientific equipment* (3850) and *radio, TV and telecommunication equipment* (3832), which both appear highly geographically specialised in employment terms, but considerably less so in export terms. Statistically, this must mean that smaller producer countries must have higher export propensities. There seems to be no ready economic interpretation of such a specialisation pattern.

Specialisation Over Time

Given the caveats that the sectoral aggregation issue imposes on a pure cross-sectional discussion of our results, we are probably moving onto more solid statistical ground in looking at intertemporal patterns. Some initial findings can be gleaned from Table 1, where we also report first differences in Gini indices over the entire sample period. We find opposite trends in broad employment and export specialisation. While the average employment Gini shows and increase from 0.168 in 1972 to 0.198 in 1996, the average export Gini fell slightly from 0.256 in 1972 to 0.247 in 1996. This mirrors and confirms the apparent contradiction in EU specialisation trends that has been found elsewhere (see Section 3 above): analysis of trade data suggests a process of industrial dispersion, while employment data tell a story of spatial concentration in EU manufacturing sectors.

The comparison of two isolated data points, however, might not accurately reflect long-term tendencies, since the two years might turn out to be outliers relative to some time trend. At this juncture we can benefit from the continuous time coverage of our data set. We have computed Gini indices annually over the whole sample period, and regressed them over a time trend. The results of pooled regressions as well as panel estimates with industry fixed-effects are reported in Table 2. The fit of the regressions is substantially better in the panel specification than in the pooled runs. Imposition of identical intercepts across industries is clearly overly restrictive, and the explanatory power of the cross section is a multiple of that of the intertemporal dimension. Nevertheless, the estimated coefficients on the time trend are interesting. We find statistically significant evidence of an increasing trend in employment Ginis. The coefficient on the time trend suggests that, on average, employment Ginis increased by 1.18 percent annually. In contrast, the estimated annual increase in export Ginis is a mere 0.09 percent, and not statistically different from zero. In other words, the dichotomy between employment and export specialisation trends is confirmed, although in weaker form. Whilst industrial clustering seems to have occurred in the EU in employment terms, no such process is evident from export flows.

It could be argued that the entire 1972-96 period is not the appropriate time horizon for a policy-relevant analysis. In particular, there might be structural breaks in the time series that we have not captured. Rather than identifying such trend breaks statistically in the

data, we chose to apply extraneous information on where to look for changes in the time trend. The most important regime-shift in policy towards manufacturing in the EU has surely occurred through the implementation of the Single Market programme. Discussion of this project began in 1985 with the publication of the Commission's White Paper. Whilst full implementation of the legislative programme extended beyond the official deadline of 1992, most EU firms began to adapt to the new policy outlook very soon after the initial announcement in 1985 (see CEC, 1997). We have therefore split our data set into the pre-1986 and post-1986 (inclusive) sub-periods, and estimated specialisation time-trends separately for each interval. Table 3 gives the results of this exercise. We find no evidence that specialisation trends accelerated in the post-1986 period. Indeed, annual percentage increases in the average Gini index were about one third lower in the post-1986 period than in the earlier years. There is thus no evidence in our data to support the predictions of some scholars that market integration in the EU might spur the formation of a more clustered US-style industrial geography across all sectors. This confirms Sapir's (1996) finding, based on export data for the four largest EU countries, that the Single Market programme has had no perceptible across-the-board impact on the geographical structure of EU manufacturing.

It might, however, be misleading to attribute observed specialisation trends averaged over all sectors to the impact of the Single Market. The evolution of specialisation patterns is influenced by a host of other factors. We do not try here to control for other determinants of industry location; this will be the focus of Section 6 below. One important feature of the Single Market project must, however, be taken account of at this stage. This is the fact that liberalisation in numerous sectors had advanced to such a point previous to the Single Market programme that these sectors were hardly affected by this policy initiative. It is therefore imperative not just to split the time series into pre- and post-Single-Market periods, but also to group industries according to their sensitivity to Single Market liberalisation. Such a grouping is provided by Buigues, Ilzkovitz and Lebrun (1990), who classified industries into three categories according to the severity of remaining intra-EU non-tariff barriers before implementation of the Single Market programme (low, moderate and high). Single-Market effects are likely to appear in industries that belong to the "moderate" and "high" categories, but less so in those of the "low" category. We have therefore regressed employment Gini indices (in logs) on pre- and post-1986 time trends industry-by-industry and reported the Buigues *et al*. (1990) classification for each industry

in Table 4. Again we find evidence of a specialisation slowdown in the post-1986 period, as 22 out of the 32 sectors exhibit smaller coefficients on the time trend after 1986 compared to the previous period. This is not the case, though, for the sectors tagged as highly sensitive to the Single Market measures. Four out of those six industries display an acceleration of specialisation in the Single Market implementation period (*beverages*; *pharmaceuticals*; *office and computing*; *shipbuilding*), and for only two out of the six industries we record a slowdown in specialisation (*radio*, *TV and telecom equipment*; *professional and scientific equipment*). If we take the "high" and "moderate" categories together, we find eight industries with higher against nine industries with lower coefficients on post-1986 time trends. The "low" category, however, comprises eleven industries with lower post-1986 coefficients against only two with higher ones. In sum, the trend towards increasing specialisation of EU manufacturing sectors has slowed down during the implementation phase of the Single Market, but the majority of those sectors which were particularly sensitive to the Single Market programme saw an acceleration in specialisation trends.

V.   CENTRE-PERIPHERY GRADIENTS

In Section 3, we have described a methodology to estimate the centrality of countries relative to each other. By calculating industry-level Pearson correlations between those centrality measures and countries' Balassa coefficients of relative specialisation, we obtain a simple statistic that captures the degree to which an industry's geographical distribution is skewed towards the central countries (if the correlation is positive) or towards the periphery (if the correlation is negative).

The results of this exercise are summarised in Table 5. The first column gives average correlations over the entire 1972-96 period. We find that, on the whole, there is no evidence of agglomeration of manufacturing activity in core EU countries. 17 out of our 32 sample industries exhibit negative centre-periphery gradients, i.e. they are concentrated in peripheral rather than central countries.

However, it is more informative to look at the evolution of our centre-periphery measure over time. With the aim of producing a clear visual picture, we do not report the size of the

annual correlation coefficients in Table 5, but only their sign and statistical significance level. It is immediately apparent that, for the majority of sectors, our data set produces no statistically significant centre-periphery gradient. Statistically significant centre-periphery gradients are found, for at least some of the sample years, in eight out of our 32 sectors. Of these eight sectors, only two are concentrated at the periphery: *wood products* (ISIC 3310); and *non-metallic products n.e.c.* (3690). Six sectors show significant concentration in central countries: *industrial chemicals* (3510); *plastic products* (3560); *office and computing* (3825); *radio, TV and telecom equipment* (3832); *motor vehicles* (3843); and *professional and scientific equipment* (3850). These six industries are among the canonical examples of increasing-returns and technology-intensive industries, for which the "new" theories are often deemed most appropriate. It is therefore interesting, and perhaps surprising, to note that the degree of concentration in central countries has been reduced towards the end of our sample period in five out of those six industries (the exception being *plastic products*). The evidence available in this study therefore suggests that, whilst specialisation in EU manufacturing is still on an upward trend (Tables 2, 3), industry concentrations are less and less guided by a country's geographical centrality or peripherality (Table 5).

VI. DETERMINANTS OF SPECIALISATION PATTERNS

In Section 2, we have outlined the difficulties faced by empirical studies that seek discriminating evidence on competing theoretical approaches. Nevertheless, we want to probe deeper than the description of general patterns and trends, by considering some salient industry characteristics and examining their impact on specialisation outcomes.

For information on industry characteristics, we draw on three sources. First, the OECD (1987, p. 272ff.) have produced a useful classification of industries "on the basis of the primary factors affecting the competitive process in each activity". We distinguish four categories:

1. *resource-intensive* industries, where the main competitive factor is "access to abundant natural resources" (9 sectors in our sample),
2. *labour-intensive* industries, where the main competitive factor is labour costs (6 sectors),

3. *scale-intensive* industries, where the main competitive factor is the "length of production runs" (10 sectors), and

4. *technology-intensive* industries, where the main competitive factors are "rapid application of scientific advance" and "tailoring products to highly varied demand characteristics" (7 sectors).[4]

Since the pivotal difference between neo-classical and "new" models of trade and location lies in assumptions on firm-level cost functions, we have in addition used Pratten (1988) for more detailed information on returns to scale. Pratten (1988, p. 2-70) has ranked manufacturing industries "in order of the importance of economies of scale for spreading development costs and for production costs", where economies of scale relate to "products and production runs" and "size of the establishment". In our industry sample, this gives us a ranking in ascending order from the industry with most pronounced increasing returns (*motor vehicles*, ISIC 3843) to the industry with the smallest minimum efficient scale (*leather products*, 3230).[5] Finally, we consider trade costs in the form of pre-Single-Market non-tariff barriers, drawing on the categorisation by Buigues *et al*. (1990).

The simplest approach is to group industries according to the classifications at hand, and to compute group-wise average Gini coefficients. Such analysis lends itself to graphical representation. We have plotted the evolution of group-level Gini indices over the entire 1972-96 time period (Figures 2-5). Rather than commenting on each graph individually, we can list the most salient findings.

- The strongest specialisation appears in traditional, low-tech industries. In the employment data, the labour-intensive category shows the highest average specialisation levels, while in the export data it is the resource-intensive industries that appear most geographically specialised. In both employment and export statistics, the labour-intensive industries display the most pronounced rate of increase in specialisation.

- In employment as well as export data, it is the technology-intensive industries that appear least geographically concentrated. However, specialisation in those industries has increased in the post-1986 period.

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[4] The OECD (1987) report subdivides our "technology intensive" category into "science-based industries" and "differentiated goods". We have amalgamated the two sectors, because we had to aggregate up from some ISIC 4-digit headings to 3-digit sectors. Aggregation did not pose a problem for the other three industry categories.

- Specialisation in the scale-intensive industries on average is neither particularly high nor particularly low. There is no evidence of an increase in specialisation in those sectors relative to the manufacturing mean.

- Employment specialisation has consistently been strongest in sectors protected high non-tariff barriers.

- Non-tariff barriers do not appear to have significantly affected export specialisation. (Analysis of variance on the group means in Figure 5 shows them not to differ significantly from the overall mean in any of the sample years.)

Each of those five stylised findings is rather at odds with intuitive expectations derived from "new" models, which generally emphasise agglomeration forces in increasing-returns sectors, unleashed by trade liberalisation.

Some results might be driven by data limitations. For instance, the low observed specialisation levels in high-tech sectors might be a result of excessively broad and inadequate product classifications. Another conceivable limitation of this exercise is under-identification. In particular, theory suggests that specialisation outcomes are the effect simultaneously of industry characteristics, such as those that inform the OECD (1987) classification, and of the sectoral magnitude of trade costs, such as proxied by our classification by non-tariff barriers.

Multivariate analysis is clearly called for. We have therefore converted the industry classifications into sets of dummy variables, and regressed the specialisation measures on all industry characteristics jointly. Table 6 reports the results. It is apparent that our principal conclusions from Figures 2-5 survive in the regressions. Labour- and resource-intensive industries are significantly more geographically concentrated than the average, technology-intensive industries are less concentrated, the scale-sensitivity of industries has only a weak impact on specialisation, and the degree of specialisation increases in the level of intra-EU non-tariff barriers.

In view of the emphasis placed in the "new" theories on the combined effects of trade costs and increasing returns, we have added an interaction term representing the joint effect of

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[5] The sector *petroleum and coal products* (ISIC 35XX) could not be matched with Pratten's (1988) classification and thus had to be dropped from the subsequent analysis.

high scale economies and high non-tariff barriers (Table 6, columns 3 and 6). In both employment and export data we find significant negative coefficients on the interaction variable. This finding is consistent with predictions of recent models: geographical concentration is high if trade costs are low and scale economies are important. Yet, the result could also suggest that geographical concentration is high if trade costs are high and scale economies are small. This configuration would have no straightforward theoretical explanation.

VII.   CONCLUSIONS AND CONJECTURES

This paper provides a comprehensive account of industrial specialisation patterns in 32 ISIC industries across 13 Western European countries, covering the period 1972-96. Locational Gini indices are calculated annually using employment as well as export data, and examined in both cross-sectional and intertemporal dimensions.

In terms of aggregate patterns, we find evidence that a process of industrial specialisation has accompanied the gradual removal of trade barriers over the last three decades. A marked upward trend in Gini indices based on employment data is detected in the majority of sectors. The distribution of employment (though not that of exports) in a representative manufacturing sector has become gradually more concentrated in a sub-group of countries. On the whole, this specialisation process reflects neither concentration in core countries nor movement towards peripheral countries; for most industries the importance of the centre-periphery dimension seems to have diminished in recent years.

Particular attention is paid in this study to the effects of the Single Market programme. There is no evidence of large-scale agglomeration tendencies following the implementation of this project, which started in 1986. On the contrary, the rate of increase in industrial specialisation on average has slowed down following the launch of the Single Market. However, industries which were directly affected by the abolition of intra-EU non-tariff barriers tended to buck the trend, as specialisation accelerated after 1986 in most of those sectors.

In grouping industries by their principal characteristics, we find that traditional low-tech sectors are the most geographically concentrated. Labour-intensive sectors have shown both the highest average level and the strongest increase in employment specialisation. Technology-intensive sectors, on the other hand, appear to be relatively evenly dispersed across EU countries. This result may, however, be due in part to inadequate statistical delineation of modern high-tech industrial activities. The finding that specialisation in these sectors has started to increase since the mid-1980s, however, should not be affected by aggregation issues, and might be a sign of emerging technological clusters. Most of the evidence in this paper suggests that the size of plant-specific scale economies does not significantly affect the specialisation level of an industry.

Venturing into more speculative territory, some of conjectures may be inferred from the findings of this paper. First, the fact that export specialisation still exceeds employment specialisation very substantially could herald a continuation of the increase in the latter. There still appears to be a large amount of manufacturing activity which is sheltered from import competition either due to trade costs or to demand biases in favour of locally-produced goods. To the extend that these barriers will continue to fall, specialisation in employment terms seems poised to progress further. The fact that specialisation has accelerated in sectors that were particularly affected by the liberalisation measures under the Single Market programme is a further pointer towards unexhausted potential for industrial clustering in the EU.

From a theoretical viewpoint, it would seem trivial to diagnose a link between integration and specialisation. Most models of trade and geography associate a fall in trade costs with increasing specialisation. Where the main paradigms differ is in terms of the determinants of the specialisation process and, as a consequence, in terms of the place where they predict concentrations to occur. We have found some evidence that specialisation in European manufacturing is becoming increasingly independent from the aggregate industrial centre-periphery ranking of countries. Market access appears to be losing some of its importance in shaping the location of industries. This leaves two other classes of locational determinants: exogenous endowments, as emphasised in neoclassical models; and industry-specific, location-independent agglomeration economies, as modelled in the new economic geography. There is much scope for future work to explore the leverage of various policy variables on these locational determinants.

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Table 1: Industry-Level Gini Indices of Manufacturing Employment and Exports, 1972 and 1996

ISIC	Description	Employment Data			Export Data		
		1972	1996	Δ	1972	1996	Δ
3110	Food products	0.141	0.147	0.005	0.435	0.326	-0.109
3130	Beverages	0.211	0.193	-0.019	0.504	0.398	-0.106
3140	Tobacco	0.203	0.336	0.133	0.564	0.553	-0.011
3210	Textiles	0.199	0.337	0.138	0.183	0.259	0.076
3220	Clothing	0.112	0.397	0.285	0.339	0.346	0.007
3230	Leather products	0.148	0.370	0.222	0.240	0.463	0.223
3240	Footwear	0.290	0.495	0.206	0.629	0.587	-0.042
3310	Wood products	0.223	0.183	-0.040	0.643	0.510	-0.132
3320	Furniture, fixtures	0.232	0.171	-0.061	0.240	0.395	0.155
3410	Paper products	0.163	0.141	-0.022	0.585	0.385	-0.201
3420	Printing, publishing	0.177	0.246	0.069	0.201	0.163	-0.038
3510	Industrial chemicals	0.131	0.158	0.027	0.192	0.182	-0.010
3522	Pharmaceuticals	0.134	0.120	-0.014	0.156	0.196	0.040
3528	Chemicals n.e.c.	0.078	0.221	0.142	0.221	0.213	-0.008
3550	Rubber products	0.088	0.178	0.091	0.228	0.163	-0.065
3560	Plastic products n.e.c.	0.078	0.120	0.043	0.211	0.133	-0.078
35XX	Petroleum, coal products	0.126	0.180	0.054	0.335	0.386	0.051
3610	Pottery, china	0.258	0.410	0.152	0.224	0.271	0.047
3620	Glass products	0.095	0.132	0.037	0.192	0.197	0.005
3690	Non-metallic products n.e.c.	0.167	0.193	0.026	0.266	0.376	0.110
3710	Iron, steel	0.179	0.194	0.015	0.159	0.133	-0.026
3720	Non-ferrous metals	0.196	0.296	0.100	0.317	0.196	-0.121
3810	Metal products	0.087	0.088	0.001	0.082	0.144	0.062
3825	Office and computing	0.199	0.330	0.131	0.163	0.365	0.201
3829	Machinery n.e.c.	0.129	0.126	-0.003	0.188	0.190	0.002
3832	Radio, TV, telecom	0.241	0.248	0.007	0.158	0.226	0.068
383X	Electrical apparatus n.e.c.	0.122	0.157	0.035	0.092	0.108	0.016
3841	Shipbuilding	0.421	0.436	0.015	0.313	0.377	0.064
3843	Motor vehicles	0.210	0.204	-0.007	0.253	0.256	0.004
384X	Transport equipment n.e.c.	0.337	0.225	-0.112	0.347	0.321	-0.025
3850	Professional, scientific eqmt	0.262	0.267	0.005	0.202	0.165	-0.037
3900	Manufacturing n.e.c.	0.186	0.276	0.091	0.358	0.345	-0.013
	Weighted average	0.168	0.198	0.030	0.256	0.247	-0.009

Table 2: Time Trends in Gini Indices, 1972-1996
(OLS; dependent variable = log of Gini; 800 obs.)

	Employment		Exports	
	Pooled	Panel	Pooled	Panel
Constant	-1.801	-2.069	-1.376	-1.023
	(-62.76)	(-123.87)	(-38.67)	(-53.47)
Year	**0.0118**	**0.0118**	**0.0009**	**0.0009**
	(5.96)	**(14.72)**	**(0.38)**	**(1.23)**
Industry dummies	No	Yes	No	Yes
R^2	0.045	0.899	0.0002	0.940

Note: heteroskedasticity-consistent t statistics in brackets.

Table 3: Pre- And Post-Single-Market Specialisation Trends
(OLS with industry fixed-effects; dependent variable = log of Gini)

	Employment		Exports	
	1972-85	1986-96	1972-85	1986-96
Constant	-2.040	-2.009	-0.986	-1.024
	(-130.07)	(-62.91)	(-40.20)	(-49.98)
Year	**0.0117**	**0.0070**	**0.0022**	**0.0014**
	(8.59)	**(5.29)**	**(1.66)**	**(0.81)**
Observations	448	352	448	352
R^2	0.947	0.976	0.959	0.959

Note: heteroskedasticity-consistent t statistics in brackets.

Table 4 Industry-Level Time Trends in Gini Indices of Manufacturing Employment, 1972-1996

ISIC	Description	Percentage Growth Rate of Gini Ind. [100 * *coefficient estimate* b_2 *from OLS regression on time trend:* $\ln(GINI)_t = b_1 + b_2 * t + e_t$]			Sensitivity to intra-EU NTBs[#]
		$t = \{72,\ldots,96\}$	$t = \{72,\ldots,85\}$	$t = \{86,\ldots,96\}$	
3110	Food products	0.49***	0.47*	-1.01***	low
3130	Beverages	-0.86***	-0.54***	0.10	high
3140	Tobacco	2.58***	2.64***	1.89***	low
3210	Textiles	1.83***	2.33***	1.90***	moderate
3220	Clothing	4.84***	6.22***	3.61***	moderate
3230	Leather products	3.85***	4.32***	2.09***	low
3240	Footwear	2.36***	2.12***	2.27***	moderate
3310	Wood products	-0.90***	-0.16	-1.77***	low
3320	Furniture, fixtures	-1.42***	-1.10***	-1.11**	low
3410	Paper products	-0.63***	0.49*	-1.42***	low
3420	Printing, publishing	1.49***	2.66***	1.69	low
3510	Industrial chemicals	0.10***	0.20	0.42*	moderate
3522	Pharmaceuticals	0.40	-1.64***	1.36	high
3528	Chemicals n.e.c.	5.00***	7.12***	1.33***	low
3550	Rubber products	2.25***	1.80***	3.71***	moderate
3560	Plastic products n.e.c.	1.75***	1.77***	2.75***	low
35XX	Petroleum, coal products	2.24***	0.52	0.24	low
3610	Pottery, china	2.82***	1.54***	1.36***	low
3620	Glass products	1.62***	2.52***	-0.10	moderate
3690	Non-metallic products n.e.c.	0.34**	0.58	0.58**	low
3710	Iron, steel	0.51***	-0.07	-0.10	low
3720	Non-ferrous metals	1.92***	1.98***	1.30***	low
3810	Metal products	-0.34**	1.10***	-0.95**	low
3825	Office and computing	1.92***	0.00	5.77***	high
3829	Machinery n.e.c.	-0.27*	-1.02***	1.14***	moderate
3832	Radio, TV, telecom	0.34***	0.38*	-0.78***	high
383X	Electrical apparatus n.e.c.	1.53***	0.42	0.29	moderate
3841	Shipbuilding	0.22***	-0.32**	0.61**	high
3843	Motor vehicles	0.60***	-0.11	-0.21	moderate
384X	Transport equipment n.e.c.	-1.27***	-1.03***	-2.87***	moderate
3850	Professional, scientific eqmt	0.16**	0.39***	-0.74***	high
3900	Manufacturing n.e.c.	1.85***	1.84***	1.82***	moderate

Note: Statistical significance tests based on heteroskedasticity-consistent standard errors; confidence levels: *** 99%, ** 95%, * 90%.

[#] Sensitivity to pre-Single-Market non-tariff barriers, according to Buigues *et al*. (1990).

Table 5: Centre-Periphery Gradients by Industry, 1972-1996

ISIC	Description	Annual Correlation Coefficients between Balassa Index and Centrality Index (n=13)[#]																									
		Avg.	*72*	*73*	*74*	*75*	*76*	*77*	*78*	*79*	*80*	*81*	*82*	*83*	*84*	*85*	*86*	*87*	*88*	*89*	*90*	*91*	*92*	*93*	*94*	*95*	*96*
3110	Food products	-0.32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3130	Beverages	-0.12	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3140	Tobacco	-0.18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3210	Textiles	-0.27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3220	Clothing	-0.27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3230	Leather products	-0.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3240	Footwear	-0.19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3310	Wood products	-0.70**	-**	-**	-**	-**	-**	-**	-**	-**	-**	-**	-**	-**	-**	-**	-**	-**	-**	-**	-**	-**	-**	-**	-**	-**	-**
3320	Furniture, fixtures	-0.09	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3410	Paper products	-0.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3420	Printing, publishing	-0.17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3510	Industrial chemicals	0.68*	+**	+**	+**	+**	+**	+**	+**	+**	+**	+**	+**	+*	+*	+**	+**	+*	+*	+*	+*	+*	+*	+*	+*	+*	+
3522	Pharmaceuticals	0.23	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3528	Chemicals n.e.c.	0.33	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3550	Rubber products	0.48	+	+	+	+	+*	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3560	Plastic products n.e.c.	0.43	-	-	+	-	-	-	-	+	+	+	+	+	+*	+*	+*	+*	+***	+***	+***	+***	+***	+***	+***	+***	+***
3580	Petroleum, coal products	-0.29	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3610	Pottery, china	-0.03	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	+	+	+	-	-	-	-	-	-
3620	Glass products	0.24	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3690	Non-metallic prods n.e.c.	-0.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-*	-*	-*	-*	-*	-	-	-	-	-	-
3710	Iron, steel	0.50	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3720	Non-ferrous metals	-0.06	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-
3810	Metal products	0.41	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3825	Office and computing	0.50	+*	+*	+*	+*	+***	+*	+*	+*	+*	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3829	Machinery n.e.c.	0.22	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3832	Radio, TV, telecom	0.61*	+*	+*	+*	+*	+*	+*	+*	+*	+*	+*	+*	+*	+*	+*	+*	+*	+*	+*	+*	+*	+*	+*	+*	+	+
3839	Electrical apparatus n.e.c.	0.24	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3841	Shipbuilding	-0.48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3843	Motor vehicles	0.55*	+*	+*	+*	+*	+*	+*	+*	+*	+*	+*	+*	+*	+*	+	+	+	+	+	+	+	+	+	+	+	+
3848	Transport equipment n.e.c.	0.31	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3850	Profess., scientific eqmt	0.67*	+***	+***	+***	+***	+***	+***	+***	+***	+***	+***	+***	+***	+***	+***	+***	+***	+***	+*	+*	+*	+*	+*	+	+	+
3900	Manufacturing n.e.c.	-0.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[#] See text for definition of variables. ** [*] denotes significance at 1% [5%] level (critical values of |r| = 0.684 [0.553])

Table 6: Determinants of Specialisation

(OLS with year fixed effects; dependent variable = log of Gini; 775 observations)

	Employment data			Export data		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Labour intensity dummy (OECD, 1987)	0.151 (2.10)**	0.149 (2.12)**	0.129 (1.85)*	0.217 (3.13)***	0.196 (3.12)***	0.164 (2.65)***
Technology intensity dummy (OECD, 1987)	-0.106 (-2.67)***	-0.295 (-8.08)***	-0.294 (-8.68)***	-0.224 (-6.97)***	-0.374 (-8.60)***	-0.373 (-9.05)***
Resource intensity dummy (OECD, 1987)	0.087 (2.03)**	0.101 (2.09)**	0.139 (2.84)***	0.571 (14.2)***	0.655 (17.5)***	0.716 (19.3)***
Scale intensity (Pratten, 1988)	-0.002 (-0.52)	0.001 (0.26)	0.005 (1.16)	0.008 (1.75)*	0.011 (2.74)***	0.017 (4.08)***
Intermed. NTB dummy (Buigues *et al.*, 1990)		0.088 (2.17)**	0.116 (2.80)***		0.222 (5.80)***	0.265 (6.64)***
High NTB dummy (Buigues *et al.*, 1990)		0.449 (9.63)***	0.713 (8.30)***		0.426 (9.14)***	0.842 (70.7)***
Scale intensity * High NTB dummy			-0.038 (-3.99)***			-0.059 (-9.22)***
Adj. R^2	0.084	0.204	0.222	0.432	0.512	0.543

Note: Statistical significance tests based on heteroskedasticity-consistent standard errors; confidence levels: *** 99%, ** 95%, * 90%.

Figure 1: A Locational Lorenz Curve

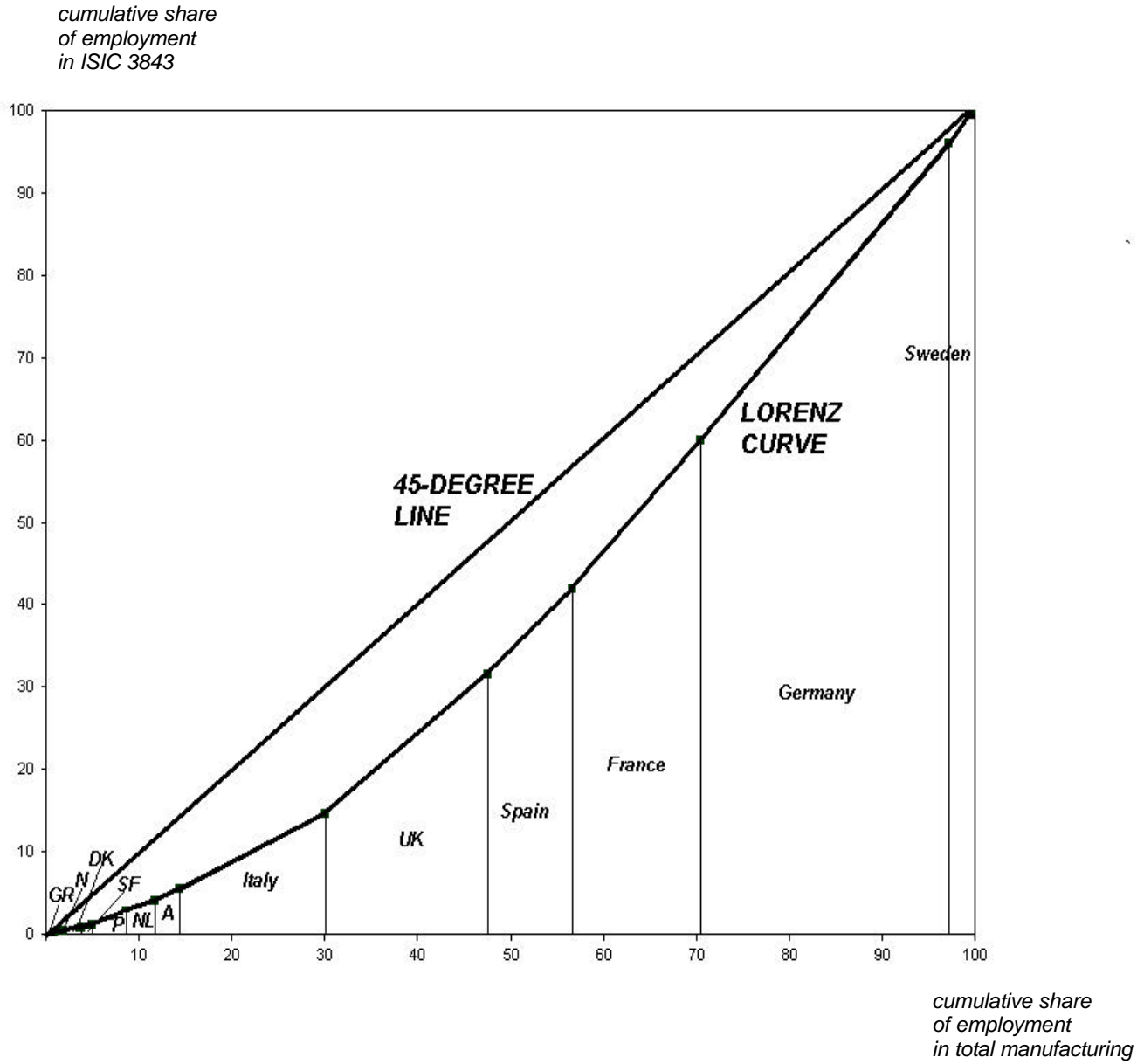(Specialisation in Motor Vehicles [ISIC 3843], 1996)

Figure 2: Employment Specialisation Patterns in Five Industry Categories
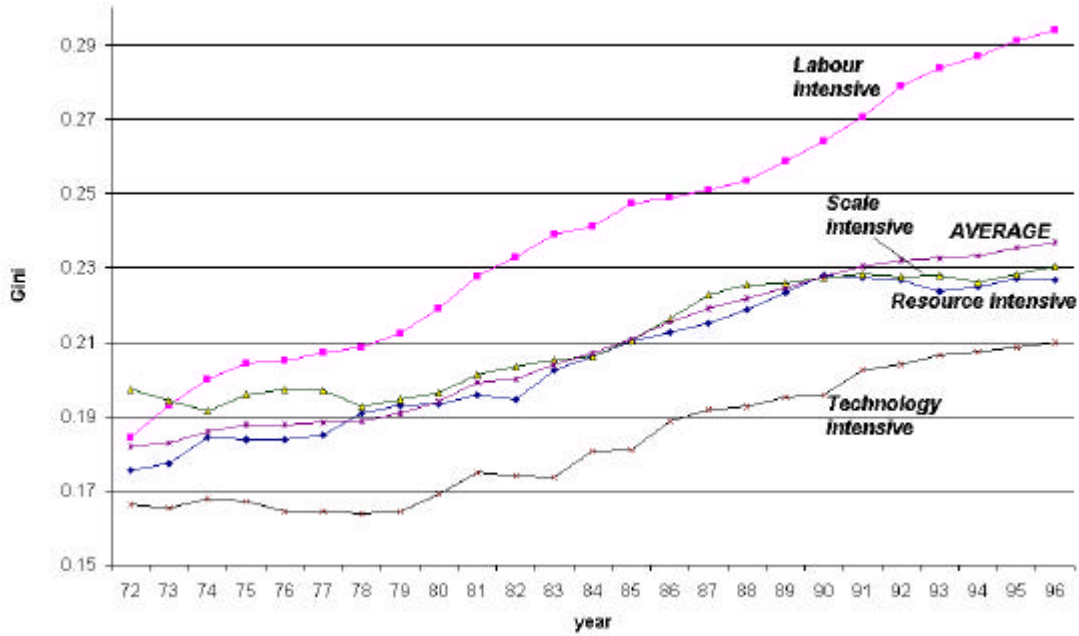
(categorisation based on OECD, 1987)

Figure 3: Employment Specialisation Patterns and Sensitivity to the Single Market

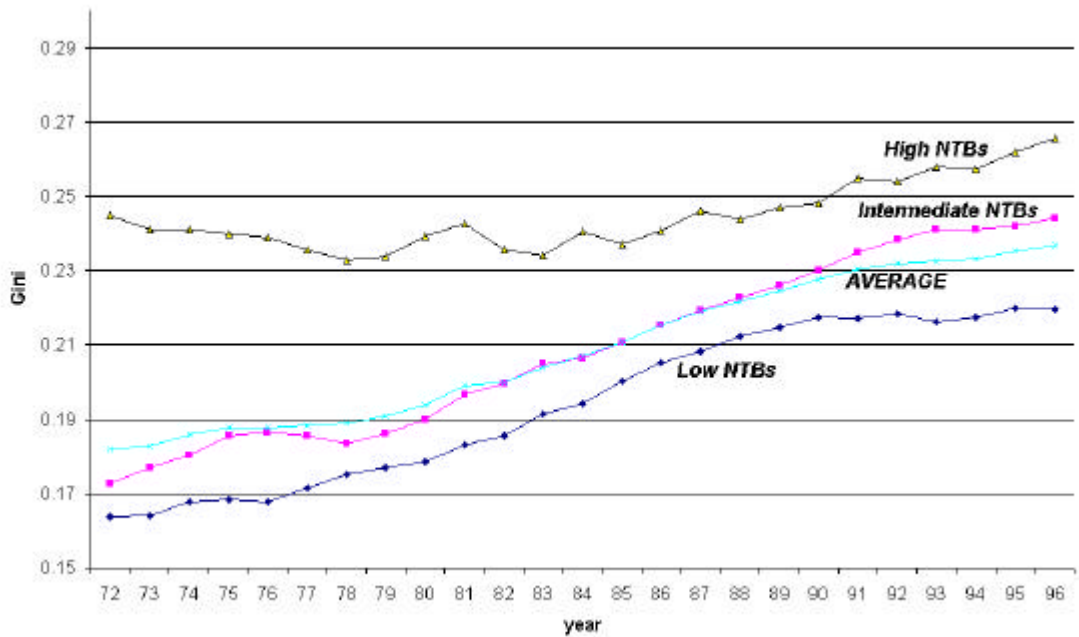(categorisation based on Buigues, Ilzkovitz and Lebrun, 1990)

Figure 4: Export Specialisation Patterns in Five Industry Categories

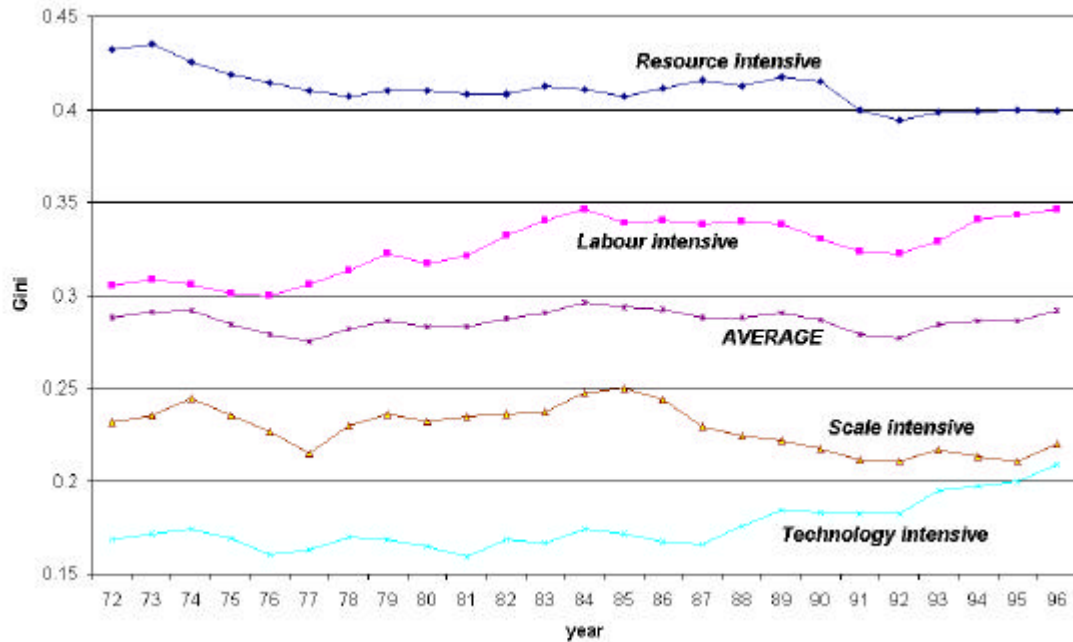(categorisation based on OECD, 1987)

Figure 5: Export Specialisation Patterns and Sensitivity to the Single Market

(categorisation based on Buigues, Ilzkovitz and Lebrun, 1990)