KARL AIGINGER

SPECIALISATION OF EUROPEAN MANUFACTURING

This article investigates changes in the manufacturing specialisation of European countries over the past 15 years, which span a single, very interesting period of European integration. The question is specifically interesting since the completion of the Single Market and the upcoming Monetary Union is expected to change the specialisation of countries. Most analysts expect specialisation to increase; their prediction relies in part on the stylised fact that the specialisation of regions is far more pronounced in the USA. There are economic advantages of specialisation: for example, specialisation is expected to raise productivity and competitiveness. Disadvantages of specialisation arise if industrial structures become too asymmetric, making countries vulnerable to industry-specific shocks. Furthermore, rapid changes in existing structures incur adjustment costs.

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The paper is structured as follows: the next chapter describes the data, the definitions and indicators used; the main evidence on production and exports follows. Finally, we describe the patterns in different countries and relate the question of specialisation to that of concentration and competitiveness. The theoretical expectations related to market integration are not reported here, as they have been covered in the paper by *Wolfmayr-Schnitzer* (in this issue). For previous empirical studies on specialisation, we refer to *Aiginger* (1999). The related question of geographic concentration is covered by *Aiginger – Pfaffermayr* (2000).

EMPIRICAL STRATEGY, DEFINITIONS, DATA

The main task of this chapter is to describe the empirical specialisation pattern of manufacturing in the European Union, and more specifically to determine whether specialisation of production (and exports) is increasing or decreasing. Trade theory suggests looking for patterns of specialisation arising from endowment differences, product differentiation or economies of scale – all of which are magnified by deeper integration. Economic geography suggests investigating the shifting division of

Table 1: Empirical literature on specialisation and concentration trends

Author, year	Variable	Indicator	Specialisation/ concentration	Time	Country/region	Data source	Aggregate	Result
Krugman (1991)	Employment	Sum of absolute differences	Specialisation	1947-1985	USA	U.S. census	3-digits SIC	In 4 regions decreasing
Bruelhart (1995)	Employment	Gini	Concentration	1980-1990	EU	EU	2-digits NACE	In 14 out of 18 sectors increasing
Dollar – Wolff (1995)	Exports	CV of RCA's	Concentration	1970-1986	9 countries	OECD	2-digits SITC	Increasing in 6, decreasing in 6 sectors
Molle (1997)	Employment	Sum of absolute differences, locational coefficient	Concentration, specialisation	1950-1990	EU, Nuts 2	EU	17 sectors	Deconcentration up to 1980s, despecialisation
Amiti (1998)	Production	Gini	Concentration, specialisation	1976-1989	EU (10 countries)	EU, Unido	27 industries	Concentration increases in 6 out of 10 countries, in 17 out of 27 industries
Dalum – Laursen – Villumsen (1998)	Exports	SD of RCA's	Specialisation	1956-1992	20 countries	OECD	20 countries	In 16 out of 20 countries decreasing
	Exports	SD of RCA's	Concentration	1956-1992	20 countries	OECD	60 industries	In 55 out of 60 industries decreasing
Laursen (1998)	Exports, R&D	See above + β	Concentration, specialisation	1971-1991	19 countries	OECD	19 sectors	Stronger decrease in exports than in patents
Haaland et al. (1999)	Production	Absolute, relative shares	Concentration	1985-1993	EU (13 countries)	OECD	35 sectors	11.4 percent increase in average industry
Knarvik et al. (1999)	Production, trade	Absolute, relative, locational coefficient	Concentration	1970-1992	EU	OECD, UNIDO	22 or 27 sectors, 104 industries	Tentative result: Europe tends to concentrate
Amiti (1999)	Production	Gini	Specialisation	1976-1989	5 to 10 countries	EU, Unido	65 or 25 industries	Increase in 30 industries, decrease in 12
	Production	Gini	Concentration	1976-1990	6 to 10 countries	EU, Unido	65 or 25 industries	Increase in 1980-1990, some decreases 1970-1980

Sectoral specialisation . . . industry structure of a country, absolute or relative to other countries, regional concentration . . . country structure ("market shares" of countries) of an industry, absolute or relative to total manufacturing, *CV* . . . coefficient of variation, *SD* . . . standard deviation, *RCA* . . . export specialisation rates (Balassa-RCA); see Box "Definitions of the Term 'Specialisation of Countries'".

Definitions of the Term "Specialisation of Countries"

We define *specialisation* of a country as the (distribution of the) shares of an industry in total manufacturing in a specific country *j*. Sweden is said to be specialised in the paper industry, since this industry has a high share in the value added of Swedish manufacturing. The production structure of a country is called "highly specialised", if a small number of industries is responsible for a large share of the production. This will be called "production specialisation"[1]. Specialisation can also be measured for exports, or for exports and imports together. If we take exports alone, we are speaking about "export specialisation", if we use information about exports and imports, we are speaking about "trade specialisation". If the production or export structures disperse (shares become more equal across industries), we are speaking about de-specialisation or dispersion.

A related concept to the specialisation of countries is the concept of geographic concentration of industries. Geographic concentration is the (distribution of the) shares of member countries in an individual industry *i*. The pulp and paper industry is said to be concentrated, if a large part of production is carried out in a few countries. Again, this interpretation can be applied to various variables (production, exports, trade) and different indicators can be used to measure concentration and its change. We use the term "geographic concentration of an industry" to make clear that the distribution in the geographic dimension is addressed. Note further that concentration is used in industrial economics to express the shares of large firms within an industry; geographic concentration should not be confused with firm concentration.

Specialisation can be investigated at the sectoral level (22 sectors, NACE 2-digit) or at the industry level (95 industries). Data are available for 14 member countries (Belgium and Luxembourg are reported together).

In brief, there are three choices to be made:

- the direction in which shares are analysed (across industries or countries),
- the variable to be addressed,
- the indicator used to quantify the trends.

[1] More precisely, we measure output or production by the value added at factor costs. While this has some disadvantages (exports are gross), it has many advantages; double counting and differences in the vertical integration over time will not effect the value added. The value added is one of the indicators most closely related to the goal of competitiveness, namely to contribute to rising factor incomes and welfare.

Table 2: Production specialisation increases, export specialisation decreases

	Production indicators						Trade indicators					
	Sector level		Industry level		Total		Sector level		Industry level		Total	
	+	–	+	–	+	–	+	–	+	–	+	–
	Number of positive or negative changes between 1988 and 1998											
Belgium	2	5	3	4	5	9	2	6	0	8	2	14
Denmark	3	4	7	0	10	4	0	8	1	7	1	15
Germany	7	0	6	1	13	1	6	2	5	3	11	5
Greece	6	1	4	3	10	4	0	8	0	8	0	16
Spain	4	3	2	5	6	8	6	2	5	3	11	5
France	6	1	1	6	7	7	6	2	4	4	10	6
Italy	7	0	3	4	10	4	7	1	3	5	10	6
Ireland	7	0	7	0	14	0	8	0	7	1	15	1
The Netherlands	0	7	1	6	1	13	2	6	7	1	9	7
Austria	5	2	6	1	11	3	3	5	4	4	7	9
Portugal	0	7	4	3	4	10	0	8	0	8	0	16
Finland	7	0	7	0	14	0	1	7	1	7	2	14
Sweden	7	0	7	0	14	0	4	4	2	6	6	10
U.K.	7	0	7	0	14	0	1	7	4	4	5	11
Sum of signs	68	30	65	33	133	63	46	66	43	69	89	135

Source: WIFO calculations using SBS and COMEXT. Indicators see Box "Indicators of Specialisation: An Overview".

labour across countries and regions and looking at whether concentration is increasing and production is shifting between the core and the periphery. The predictions allow for different outcomes, depending on the relative strength of economies of scale, on the importance of transport costs and on the degree of comparative advantage, even if the problem at hand is well defined. Empirical data are influenced by a multitude of forces, be it globalisation, integration, cyclical development, or policy influences, so that we cannot expect the outcome to be in line with a specific theory. An overview of previous studies on specialisation (and the related concept of concentration) is given in Table 1. This study is different from the past ones, in that it covers the largest part of the 1990s, including six years after the completion of the Single Market Programme (1993-1998).

We use data on value added from 1985 to 1998 to determine specialisation in production and trade, and data from 1988 to 1998 to analyse how specialisation in trade has changed. We chose seven indicators of specialisation to show whether increasing specialisation or de-specialisation (dispersion across industries) is the stronger trend. For trade, we add an additional indicator, which combines information on exports and imports, while the others refer to exports only (see Box "Indicators of Specialisation: An Overview").

THE MAIN TRENDS FOR PRODUCTION AND EXPORTS

The data reveals no single, dominating tendency, either in the direction of increasing specialisation or in the direction of dispersion. However, the data show that production specialisation tends to increase marginally, while export specialisation tends to decrease.

PRODUCTION SPECIALISATION INCREASES WEAKLY

The increasing specialisation of countries is a weak tendency; it depends on indicators and the time period

Figure 1: Production and trade specialisation

Percentage share of the largest five sectors

Source: WIFO calculations using SBS and COMEXT.

Indicators of Specialisation: An Overview

Specialisation indicators are numerous. Each offers some advantages and highlights certain aspects. They are similar to the indicators used in industrial organisation and welfare economics, where the main goal is to measure the market power of firms and the degree of income inequality. In order to minimise the chance that different indicators produce different results, we use the same indicators to measure specialisation and concentration.

- *Concentration ratio:* This indicator calculates the share of the largest n units in the total and is called CR_n, e.g., CR_3, if we are talking about the share of the largest three industries. It is easy to calculate and easy to interpret. Its disadvantages are that it makes use only of the information provided by the largest units, that the relative size of each unit within the group of large units is not accounted for, and that there is no good guide as to how large n should be. We have chosen n to be either 3 or 5, if we are analysing specialisation at the sectoral level or concentration at the country level; and 5 or 10, if we are analysing specialisation at the industry level.
- *Herfindahl (H):* This measure is popular in industrial economics and in competition policy. It sums up the squared share of each sector or industry in total manufacturing. Though the measure formally makes use of all information, its value is heavily influenced by the largest (market, export, country) shares.
- *Standard deviation of the shares (SD shares):* This takes into account all available information, highly weighting positive and negative outliers. In the literature on the convergence of income, it is one of the most commonly used indicators. Sigma-convergence is reported if the standard deviation of per-capita income or of productivity falls. It is regularly used in specialisation studies, but less often in industrial organisation.
- *Specialisation rates (SR):* These divide the share of an industry in one country into the share of the same industry in some total. The specialisation rate divides the share of a country in an industry into its share in total manufacturing. If we would measure geographic concentration, we would divide country shares in an individual industry into the country shares in total manufacturing. In trade analysis, this indicator is called RCA-Balassa (in contrast to a net-RCA which combines information on exports and imports), in economic geography it is sometimes called the locational coefficient. The information about the relative position in each industry must then be summarised again by calculating the standard deviation of the specialisation rates. This indicator uses all available information; it needs a norm and gives a rather large weight to small industries and countries. It is sometimes called a measure of "relative concentration", since the share in a specific industry is related to that in manufacturing. Indivisibility causes the ratio to grow quite large for small industries and small countries, heavily influencing the resulting indicator. Furthermore, since the ratio is not symmetric (it is between 1 and infinity for positive specialisation and between 0 and 1 for negative specialisation), $SRA = (SR - 1)/(SR + 1)$ must be used to transform the ratio into symmetry. This transformation is specifically useful in econometric work; its standard deviation is known as SD-SRA.
- *Sum of absolute differences (dissimilarity, sum-AD):* Here, the differences between the shares in a country and the norm are summed up, without regard to the signs. It strengthens the dissimilarity of a specific country from a norm; all available information is used. Since absolute differences are added together, problems do not arise from relations and the weight assigned to small industries is correctly sized.
- *Gini coefficients:* This indicator sums up differences in the specialisation rates by accumulating the (differences in the) shares of a country and the shares of the norm (EU), after ranking the industries according to their specialisation ratios. It is a summary measure using all information, and weighting it. Its advantages and disadvantages are discussed in the literature on income distribution (Lorenz curves). A specific Gini coefficient can correspond to different distributions, and it is difficult to interpret the absolute value derived.

The above mentioned indicators define a wide span. The CR_n is the most intuitive, Gini and Herfindahl may be the most abstract. Some of the indicators do not measure a country against a norm and are therefore called absolute indicators (the first four). Others relate industries or countries to such norms as specialisation rates, the dissimilarity index or Ginis (the last three indicators). Absolute indicators implicitly focus attention on large countries; relative indicators often implicitly give more weight to small countries. The difference between absolute and relative indicators was stressed in *Haaland et al.* (1999) and in *Knarvik et al.* (1999), whereas the latter defines a parallel for each indicator and an absolute and a relative version.

analysed. There are significant differences across countries. However, the share of the largest industries in *production* (i) increased in most individual countries, (ii) increased at the sector level, as well as at the industry level and (iii) in the average of the EU countries. Taking 7 indicators, 14 countries and two levels of aggregation results in 196 signs, 133 of which are positive, indicating that the forces towards the specialisation of European production are dominant[1].

Specialisation tended to decrease from 1985 to the beginning of the 1990s, and has increased since then. A comparison with the period 1988 to 1998, which we use to maximise the comparability with trade data, may to some extent overestimate the trend towards production specialisation. On the other hand, starting the analysis in 1990 or 1991 would aggravate this even more. We index and average the seven specialisation indicators for production and the eight indicators for trade into a "composite indicator", illustrating this trend in Figure 2.

EXPORT SPECIALISATION DECREASES

For exports we find a tendency of decreasing specialisation. There are only five countries in which the majority of indicators exhibit increasing specialisation in exports: Germany, Ireland, Italy, France and Spain. With the exception of Ireland, these are large countries. There is a group of countries in which export specialisation is declining, while production specialisation is increasing. This group includes the U.K., Sweden, Finland and to some extent Greece. In the other five countries, export specialisation is declining, contributing to a total of nine countries with downward trends. The indicator for which this downward trend is most pronounced is the RCA value, which provides information on net trade (see Table 4)[2]. It declines in 12 countries on the sectoral level and in 13 on the industry level; the average decline is rather strong. It is this indicator which is used predominantly in empirical work, in efforts to provide evidence on specialisation, as predicted by the Heckscher-Ohlin theory, namely on the relative specialisation of exports and imports. 89 out of the total 224 indicators[3] are positive, showing that the data reject the hypothesis that the result is driven by chance. In our following work, we do not give country specialisation profiles (*Aiginger,* 1999), but rather only highlight developments which are significant to an understanding of the main movements of changing specialisation.

The different trend in production and in export specialisation may be a consequence of the fact that the latter had been higher before and that deepening the integration leads to an adjustment of the production structure. It may also come from differences in definitions used for exports and production, different dynamics of consumption and imports and from strategies of multinational firms. We try to acquire information by analysing the trends by countries and investigating in which industries the trends diverge most.

GERMANY, ITALY AND IRELAND: PRODUCTION AND EXPORT SPECIALISATION RISE ROBUSTLY

GERMANY

Germany started from a position with a moderate degree of specialisation. Production specialisation decreased between 1985 and 1990 or 1991, and has been exhibiting a rising trend ever since[4]. The large sectors are those which account for large proportions in the EU total – of which Germany has been producing slightly less than one third. However, German manufacturing is more specialised in its leading sectors. These are the skill intensive mainstream sectors of machinery, motor vehicles and chemicals, with electrical machinery and metal products following. The ranks of the leading sectors are constant, their share is now slightly larger.

Export specialisation follows production specialisation in its upward trend; 11 out of 16 indicators are on the rise. However, if we measure trade specialisation by the standard deviation of net exports (exports minus imports, see the net RCA value), specialisation declines for sectors, as well as for industries. The reason is twofold and holds more generally for other countries: the first is an increase in intra-industry trade in a stronghold, the second is weak demand in resource intensive industries with traditional trade deficits:

- The share of the motor vehicle industry in German total exports increased from an already high level of 17.4 to 18.9 percent. But since imports surged from 8.4 to 12.1 percent, the relative specialisation (more precisely, the export surplus of the industry relative to total manufacturing) declined. This relation is captured by the RCA

[1] This result is statistically significant at the 99 percent level. Significance tests relying on one indicator only prove the significance of rising specialisation for all countries (taken together) and for Ireland.

[2] The *RCA* is measured here as exports related to imports in an industry relative to total exports or imports. On the 3-digit level, this ratio is declining in all countries except Ireland. The specialisation rates (called RCA-Balassa) declines in all 14 countries.

[3] For trade, we have 224 signs (8 indicators, 14 countries, 2 levels of aggregation). Since only 89 are positive, we can reject the possibility that this result is driven by chance (with 99 percent significance, applying a binomial test).

[4] The data now includes the former GDR; these regions did not decrease the degree of specialisation but rather complemented the old structure.

Table 3: Country table of specialisation trends

Product specialisation	Trade specialisation		
	Increasing	No change	Decreasing
Increasing	Ireland, Germany, Italy	Denmark, Austria	Finland, U.K., Sweden, Greece
No change	Spain	France	Belgium
Decreasing		The Netherlands	

Source: WIFO calculations using SBS and COMEXT. Trend in Table 2 summarised.

value which amounted to 0.67 in 1988 and declined to 0.55 in 1998. The economic background is an increase in the intra-industry trade.

- Most of the resource intensive industries had large negative RCA values in 1988, which declined up to 1998. Petroleum products and pulp and paper are examples of sectors with traditional import surpluses. However, while the low exports kept up with the general growth of total exports, the absolutely higher imports did not keep up with import growth, thus decreasing the net RCA. Economically, the low income elasticity of these industries, the ability of downstream industries to economise on inputs, as well as the ability to uphold exports in niches or across borders contributed to decreasing specialisation as measured by RCA.

These two components of decreasing standard deviation of net RCA values are valid for other countries as well (see Table 4).

Germany has a larger than average sector of mainstream industries, and is holding this constant. The share of research-intensive industries decreased, while the small segment of advertising-intensive industries increased. Moderately globalised industries have a high share in Germany, which they are strengthening. The increase in the sector of low wage industries may be due to the incorporation of the provinces from former East Germany.

ITALY

Italy started from the lowest level of specialisation among the EU countries; its specialisation is now increasing for production and exports. The driving force is the persistent rise in the machinery industry, which presently accounts for 14 percent of production and 21 percent of exports – a stronghold which has been lost is office machinery. The shares of the textile industries have been decreasing slightly, but less than in other countries, leading to increasing market shares for Italy in this sector, to an increase in Italy's share of labour-intensive industries, and to more dissimilarity in Italy's production structure from the EU average. However, Italy is focusing on the quality segment of the textile industries. The unit value of its exports is significantly higher than that of average European exports. Italy was confronted with a strong currency devaluation during the period under investigation, in addition to a shift in its policy regime to meet the criteria for the Monetary Union.

Data Bases Used and Treatment of Missing Values by WIFO

2-digits are called "sectors", 3-digits are called "industries"

Manufacturing: NACE 15 to 36

Export data

COMEXT (provided by Eurostat) available from 1988 to 1998

"EU": EU 12 up to 1994, EU 15 since then

WIFO added data for Austria, Finland and Sweden for 1988-1994 by using SITC-data (UN)

Estimated due to missing data: December 1998 for Ireland

Production data

SBS (Structural Business Statistics, provided by Eurostat) from 1985 to 1998

Complete for total manufacturing (up to publication in 1997; in the 1998 data set some previously reported figures on total manufacturing were deleted).

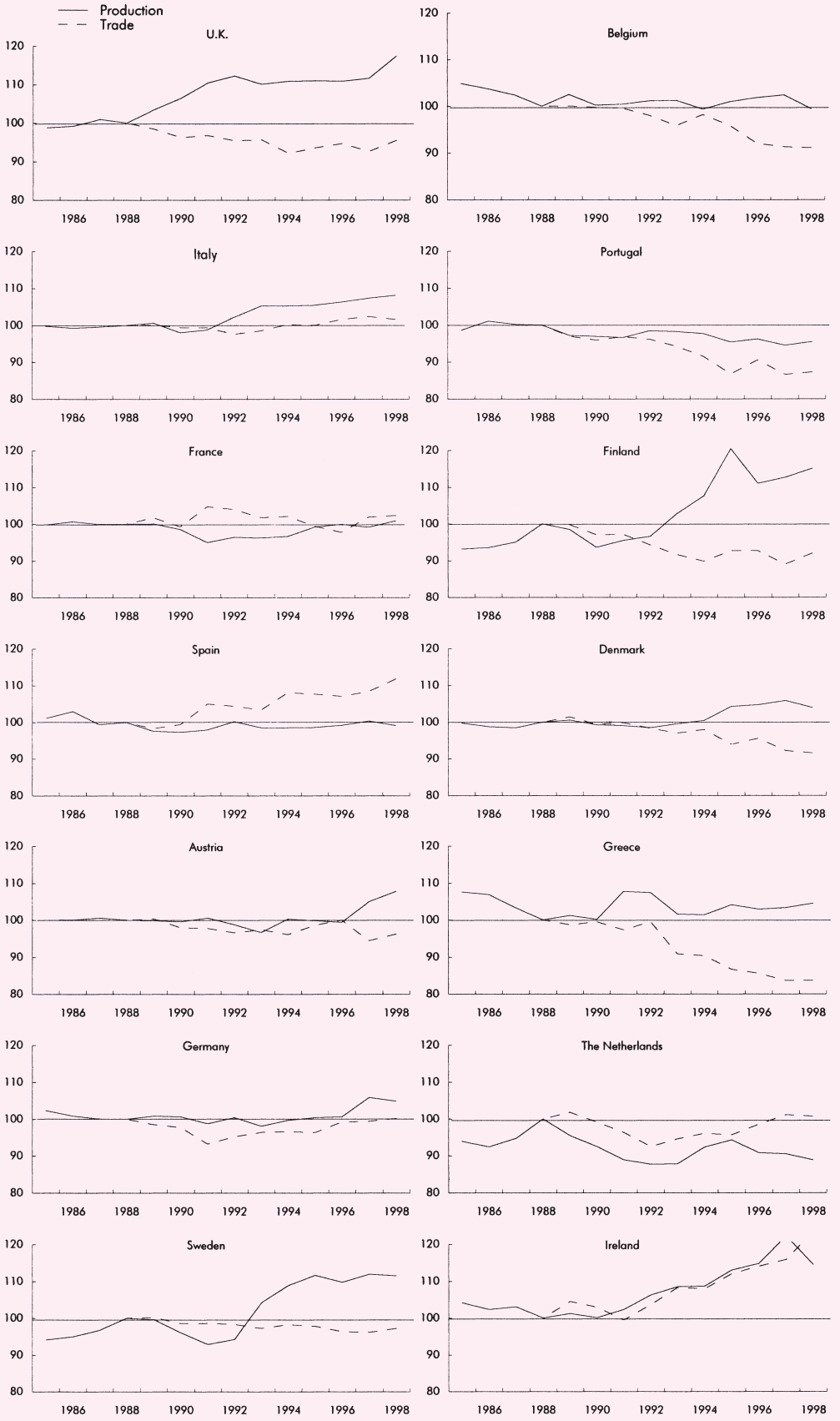
Some missing entries on the 2-digit level and up to 30 percent missing values on 3-digit level; specifically early and late years, were interpolated or substituted by techniques described in *Aiginger* (1999).

IRELAND

Ireland maintained its position as the most specialised country. During the last ten years, it continued to intensify its specialisation. The top three sectors in Ireland produce 56 percent of its industrial output. The largest sector is the chemical sector (basic chemicals and pharmaceuticals), whose production share increased from 16.4 to 27.2 percent. Large increases also took place in office machinery and in the printing and publishing sector (reproduction of recorded media). Ireland also has the highest degree of structural change (mobility of structure): the food industry, which was a former stronghold, lost 7 percentage points; textile industries and wood related industries were never strong, and continued to decrease their shares.

Ireland now has the largest share in manufacturing in research-intensive industries, although these are mainly subsidiaries of multinational firms with headquarters outside of the country. Ireland's share of labour-intensive indus-

Figure 2: Specialisation trends in production and exports



Source: WIFO calculations using SBS and COMEXT. Composite indicator (indicators are indexed; unweighted average, 1988 = 100). Countries are ranked from low to high specialisation in 1988.

Table 4: Countries with differences between production and exports specialisation trend

	Value added Specialisation (CR_3) of sectors		Exports Specialisation (CR_3) of sectors		Largest difference between production and export trends
	1988	1998	1988	1998	
Finland	40.50	40.74	53.62	50.36	Pulp, paper and paper products, ships and boats
Sweden	34.88	35.51	44.22	42.31	Machinery and equipment n.e.c., pulp, paper and paper products
U.K.	31.70	33.62	37.90	37.75	Food products and beverages, publishing, printing and reproduction, chemicals and chemical products

Source: WIFO calculations using SBS and COMEXT. CR_3 . . . concentration ratio of the three largest sectors (see Box "Definitions of the Term 'Specialisation of Countries'").

tries is the lowest in Europe. Ireland is positively specialised in high-growth, highly globalised industries, in the high productivity sector, and has reinforced all of these strengths during the last decade. The structural funds, a tax policy favourable for businesses, the upgrading of its educational system and the return of skilled workers have together created a successful policy mix which attracts and upgrades firms in dynamic industries.

U.K., FINLAND, SWEDEN AND GREECE: INCREASING SPECIALISATION IN PRODUCTION BUT REVERSE PATTERN IN EXPORTS

U.K.

In the U.K., the difference between increasing the specialisation of production and decreasing the specialisation of exports is driven by developments in three sectors: food, chemicals, and publishing and printing. In the food sector, production seems to have substituted imports. In the chemical sector, this has not been the case. In printing, export shares are generally low. In machinery, industry production as well as exports have lost shares. In basic metal production, the decline was less steep than export losses, contributing to the divergence of production and export trends. The contrary development has been evident in car manufacturing, where production has risen less than exports.

Relative to the EU, specialisation is strongest, as well as increasing, in other transport (aircraft and spacecraft) and publishing and office machinery (the share of which is falling, but increasing relative to the steeper decline in other countries). On the industry level, motor vehicles, office machinery and telecommunications equipment increased their export shares and contributed to an overall increase in the standard deviation of export shares and the Herfindahl. However, a parallel increase in import shares leads to a declining RCA value. On the other hand, positive specialisation in publishing, medical equipment and again office machinery was strengthened. Negative specialisation in wood and pulp and paper diminished.

FINLAND

Finland has a moderate position in specialisation, and also combines increasing production specialisation with decreasing export specialisation. Finnish production is characterised on the one hand by pulp and paper, while on the other hand, machinery climbed to second place, and telecommunications tripled their output. The food industry and the textile industries are losing shares; wood and wood related industries are rather stable.

Export specialisation is decreasing according to most indicators. The main reason is that the export share of paper dropped from 32 to 23 percent. This is in contrast to rising production in the pulp and paper industry. One reason for the diverging trend between production and exports could be that the headquarter function of Finnish firms is strengthening the basis for creating value added. A wood and paper cluster provides services which increase value added, but some of these services are not reflected in exports or at least are not reported as exports of manufactured goods[5].

SWEDEN

Sweden has a moderate position in specialisation, with the same split between the trend in production and exports. The largest four sectors are in production, with paper and motor cars increasing their shares, while food and machinery are losing shares. The greatest jump occurred in telecom equipment, which increased its share in production by 5.9 percentage points to 8.9 percent of value added and is now the largest exporter.

Paper's share in production is rather stable, its share in exports is falling. For machinery, production shares are increasing, while export shares are on the decline. In neither case can imports account for the difference, possibly hinting again at the effect of multinational firms increasing headquarter services, but shifting part of their exports to foreign production and thus contributing to the divergence of production and export trends.

[5] In general, the following circumstances can cause differences in increasing production and decreasing export shares in a specific industry in a specific country: imports decline rather strongly; domestic demand increases more than proportionally; production and trade statistics are based on different concepts; production is classified according to main activities, exports to products; if the non characteristic products increase, production will be more dynamic; production is measured by value added, exports by sales; if the degree of vertical integration is reduced, value added can be more dynamic than exports, which do not depend on the degree of consolidation of production.

Table 5: Declining imbalances of exports and imports in sectors

Revealed comparative advantages rates (net RCA concept) decline

	SD of net RCA		Examples for	
	1988	1998	decreases in negative specialisation	decreases in positive specialisation
Belgium	0.421	0.229	Wearing apparel, dressing and dyeing of fur Machinery and equipment n.e.c	Basic metals
Denmark	0.761	0.679	Chemical and chemical products Other non-metallic mineral products	Other transport equipment
Germany	0.671	0.546	Coke, refined petroleum and nuclear fuel Pulp, paper and paper products	Motor vehicles, trailers and semi-trailers
Greece	1.451	1.111	Electrical machinery and apparatus n.e.c. Radio, TV and communication equipment	Wearing apparel, dressing and dyeing of fur
Spain	0.967	0.627	Tobacco products Radio, TV and communication equipment	–
France	0.482	0.411	Tobacco products Wood, products of wood and cork	Other transport equipment
Italy	1.311	1.213	Coke, refined petroleum and nuclear fuel Pulp, paper and paper products	Wearing apparel; dressing and dyeing of fur
Ireland	0.813	0.817	Coke, refined petroleum and nuclear fuel	Food products and beverages
The Netherlands	0.577	0.591	Radio, TV and communication equipment	Chemical and chemical products
Austria	0.768	0.466	Coke, refined petroleum and nuclear fuel, Furniture; manufacturing n.e.c.	Other non-metallic mineral products
Portugal	1.250	0.961	Electrical machinery and apparatus n.e.c	Wood, products of wood and cork
Finland	1.035	0.951	Coke, refined petroleum and nuclear fuel Office machinery and computers	Pulp, paper and paper products
Sweden	0.874	0.867	–	Pulp, paper and paper products
U.K.	0.811	0.733	Wood, products of wood and cork	Electrical machinery and apparatus n.e.c.
EU	0.210	0.193	Coke, refined petroleum and nuclear fuel Radio, TV and communication equipment Wood, products of wood and cork	Electrical machinery and apparatus n.e.c. Rubber and plastic products

Source: WIFO calculations using COMEXT. SD . . . standard deviation, $net\ RCA_j = ln\ \frac{\frac{X_i}{M_i}}{\frac{X}{M}}$, i . . . sector, j . . . country (see Box "Definitions of the Term 'Specialisation of Countries'").

GREECE

Specialisation in production is increasing in Greece, specifically in food, petroleum products and chemicals, and in construction related industries. It was once the country with the highest export specialisation, which despite declining specialisation is still above average. The decreasing specialisation is due to losses in the textile and apparel sector. The food sector is now the largest export sector. The share of intra-industry trade is lower than in all other EU countries.

PORTUGAL: ROBUST DECREASE IN SPECIALISATION

Portugal is the exception: specialisation is decreasing strongly and robustly in production, as well as in trade data. This declining specialisation reflects the shrinking share of the textile industry, which once accounted for 13.4 percent of production, but dropped to 9.4 percent in 1998. Food production and wood related industries lost, too. The apparel and leather industries maintained their shares in production. Since the other European countries decreased production, the shares of these sectors are now four, respectively, five times higher than in total Europe (leading to increased specialisation rates in contrast to the trend of strongly decreasing specialisation, as shown by other indicators).

The drop has been compensated primarily by a rise in the motor industry and to a lesser extent in electrical machinery. On the industry level, motor vehicles are the largest item, accounting for 13 percent of exports and pushing specialisation measured at the industry level up. It surpassed the apparel industry as the largest exporter.

Portugal managed to narrow its deficits in advertising-intensive industries (tobacco, shoes) and in research-intensive industries (agro-chemicals, electronic valves, telecom apparatus and motor vehicles).

NO ROBUST TREND IN OTHER COUNTRIES

The countries mentioned above demonstrated three tendencies: robustly increasing specialisation in the first group, splitting production and exports in the second, and declining specialisation in Portugal. The other countries did not exhibit any clear trends in either the dimension of specialisation or dispersion.

CONCLUSION

The process of European integration (the Single Market Programme as well as the Monetary Union) provides an opportunity to investigate the consequences of integration on the specialisation of countries. In contrast to previous studies, this article contains data on the six years following

the completion of the Single Market Programme (1993-1998). Specific interest in this question has been raised since specialisation in U.S. regions is much higher than in Europe. The main findings are as follows:

- The empirical data show the strengthening of certain clusters, specifically of large industries in large countries (e.g., the manufacturing of cars in Germany, machinery in Italy, chemicals in France, and food in the U.K.). This movement is contributing to a rise in the specialisation indicators for production in a majority of countries. The tendency is, however, weak. Its strength varies between countries. Portugal, for example, is broadening its production structure and its exports, while Ireland is enjoying high and increasing specialisation.
- The second movement is the de-specialisation of manufacturing exports. In most countries, export specialisation in 1998 was lower than in 1988. Increasing specialisation of production for stable export specialisation is not unexpected, since the exports were initially more specialised than production. Integration then implies that production specifically targeted for the home market decreases. Production specialisation should therefore increase towards the level of export specialisation. However, this does not explain the decrease in export specialisation.
- In several countries, increasing production specialisation (higher shares of important industries) co-exists with decreasing export specialisation. Finish pulp and paper, the machinery industry in Sweden, and the chemical industry in the U.K. are examples of this trend. It could be attributable to the larger share of services, which are included in the value added, but not in the exports of manufactured goods. It could also be an effect of multinational firms which supply increasing services in their headquarter countries, while decentralising production (in part, horizontally, by purchasing firms and shifting some of their home production to subsidiaries, and, in part, vertically). This is in line with the theoretical prediction that firms use their firm specific knowledge to build plants in foreign markets. This process of multi-nationalisation is accelerated when the set-up costs of establishing a new plant abroad decrease through integration. This may result from the convergence of business rules, decreasing national preferences, the convergence of endowments, or the mobility of managers. Home biases and biases in favour of large countries as industrial locations with a high minimum efficient scale decrease.
- The fastest decline in specialisation is shown by the indicator of revealed comparative advantage, which summarises information on exports and imports. A decline in the standard deviation of the net-RCA indicator demonstrates that both large surpluses and large deficits are decreasing. One component contributing to the reduction of imbalances is increasing product differentiation and – related to this – a higher share of intra-industry trade. This tendency allows a parallel increase in imports and exports, thus pushing down the relation of exports to imports, specifically in industries in which exports were previously dominant. An example is the German car industry, which increased both exports and market shares. However, since imports expanded relatively faster (from a much lower level), the relation of exports to imports declined. The other component involved in lowering net-RCA is decreasing relative deficits: the demand for raw materials and semi-finished products (pulp, basic metals) is growing slowly, due to the technical progress made in reducing the consumption of raw materials. Furthermore, some of the necessary refinements (new materials, composites, upgrading characteristics) are carried out in industrial countries. This limits any increases in imports and stabilises exports in areas where high income countries have always had high deficits. Another way of formulating this process is that resource-based trade patterns (as forecast by the Heckscher-Ohlin theory) lose importance and intra-industry trade increases.

The overall speed of change in the degree of specialisation over the past 15 years has not been dramatic. Trends in aggregates are often weak, so that the choice of the indicator, the exact time period, or the level of aggregation can yield different pictures; firm specific effects determine development in specific countries and industries. The speed of change seems to have increased during the 1990s, i.a., due to the effects of the Single Market Programme. Theories do not unambiguously predict rising or declining specialisation and the data are in line with the presence of overlapping forces, partly pushing towards specialisation and partly towards de-specialisation.

The main policy conclusion is that fears of extremely fast and disadvantageous types of specialisation are therefore not substantiated by the data. Extremely large imbalances in trade are evening out. If anything, from the efficiency standpoint, there is still not enough structural change in Europe. Productivity is still considerably lower than in the USA; the process of catching up in productivity has temporarily come to a halt, since growth in manufacturing has been higher in the USA during the last several years. Stronger growth is needed in Europe to stabilise employment. Specifically, growth in fast moving industries (information and telecommunications-related, as well as marketing-driven industries) is slower in Europe; modern serv-

ices complementary to hardware products are not creating enough jobs to decrease unemployment.

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Specialisation of European Manufacturing – Summary

The process of European Integration (the Single Market Programme as well as the Monetary Union) provides us with an opportunity to investigate the consequences of integration on the specialisation of countries. In contrast to previous studies, this article contains data on the six years following the completion of the Single Market Programme (1993-1998). Specific interest in this question has been raised since specialisation in U.S. regions is much higher than in Europe.

The main findings are as follows:

- The empirical data show a weak tendency for a rise in the specialisation indicators for production in a majority of countries. Its strength varies between countries. Portugal, for example, is broadening its production structure and its exports, while Ireland is enjoying high and increasing specialisation.
- Secondly for most countries export specialisation is decreasing. It is not surprising that – during the process of integration – production specialisation increases towards the (higher) level of export specialisation. However, this does not explain the decrease in export specialisation. In several countries, increasing production specialisation (higher shares of important industries) co-exists with decreasing export specialisation. Finish pulp and paper, the machinery industry in Sweden, and the chemical industry in the U.K. are examples of this trend. Some tentative explanations – among them the impact of multinational firms spreading production from an expanding headquarter are offered.
- The fastest decline in specialisation is shown by the indicator of revealed comparative advantage, which summarises information on exports and imports. A decline in the standard deviation of the net-RCA indicator demonstrates that both large surpluses and large deficits are decreasing. One component contributing to the reduction of imbalances is increasing product differentiation and – related to this – a higher share of intra-industry trade. The overall speed of change in the degree of specialisation over the past 15 years has not been dramatic. Trends in aggregates are often weak, so that the choice of the indicator, the exact time period, or the level of aggregation can yield different pictures; firm specific effects determine development in specific countries and industries. The speed of change seems to have increased during the 1990s, i.a., due to the effects of the Single Market Programme. Theories do not unambiguously predict rising or declining specialisation and the data are in line with the presence of overlapping forces, partly pushing towards specialisation and partly towards de-specialisation.
- The main policy conclusion is that fears of extremely fast and disadvantageous types of specialisation are therefore not substantiated by the data. Extremely large imbalances in trade are evening out. If anything, from the efficiency standpoint, there is still not enough structural change in Europe. Productivity is still considerably lower than in the USA; the process of catching up in productivity has temporarily come to a halt, since growth in manufacturing has been higher in the USA during the last several years.