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Increasing productivity gap and low speed of change

IN: FRITZ BREUSS/GERHARD FINK/STEFAN GRILLER (HG.), VOM SCHUMAN-PLAN ZUM VERTRAG VON AMSTERDAM. ENTSTEHUNG UND ZUKUNFT DER EU, WIEN, SPRINGER, 2000, PP 166-193

I. European competitiveness at the entry into the “New Economy”

Most economists shared two beliefs as for structure and growth of Europe in the nineties. The first was that Europe would catch up in productivity with the leading US economy and secondly that integration would lead to higher concentration of industries and maybe even favouring the core countries at the expense of the periphery. We show that both expectations were not fulfilled. First, starting in the nineties the US growth, as well as its growth in productivity surpassed the European growth, thus increasing the absolute difference in productivity and secondly regional concentration did not rise. These phenomena could be related insofar as the speed of change in Europe - restructuring for example manufacturing according to the new economic conditions - was too slow in Europe, as the USA entered the New Economy faster than Europe.

II. Growth in the nineties: the USA forges ahead again

The European economy for the past thirty years grew at rates similar to the US, but employment was increasing faster in the USA, implying a lower productivity growth. This was first discussed as the phenomenon of productivity slowdown, and then as employment intensive growth in the US. Many observers criticised that the USA - despite being the richest economy in the world - had opened a segment of poorly paid “Mac Jobs”, creating a group of working poor who could not live with one job only. European productivity grew stronger, filling the gap to the leading US, however also contributing to the rising unemployment rate.

	GDP per capita	Population / labour force	GDP / labour force	Labour force / employee	GDP / employee	GDP / hour
USA	31,487.2	1.96	61,808.3	1.05	64,722.4	33.78
Japan	29,905.1	1.86	55,714.3	1.04	58,110.6	31.06
EU	22,476.8	2.21	49,610.4	1.11	55,126.2	31.25
USA	100.0	100.00	100.0	100.00	100.0	100.00
Japan	95.0	94.91	90.1	99.60	89.8	91.94
EU	71.4	112.44	80.3	106.12	85.2	92.51

Source: WIFO database, OECD, Economic Outlook, IMD (Working hours).

Table 1: GDP per capita and per hour 1998

The absolute level of the productivity difference is difficult to estimate. Taking the GNP per capita data, the difference may be about 29%, but the USA have a higher employment-rate relative to population and working time is longer. Taking these factors into account a difference of 8% remains for value added per hour, probably the most interesting figure in productivity comparisons. The difference rises again to 12% if we recognise that purchasing power is higher in the USA.

It is less difficult than the calculation of the absolute difference to show that the gap is widening again approximately since 1993 or 1995. There are various explanations for this: The interpretation as a cyclical phenomenon came first, attributing higher growth of productivity to higher macroeconomic growth and “jumping” over the European currency crisis in 1993/94. Continued differences in growth lead to the alternative explanation that the revolution in information and communication technologies (ICT) had shifted the USA into a new area of cyclical growth at a high growth path (the “New Economy”). It can be demonstrated that the share of the ICT industries is much higher in the USA in production, but even more in consumption. This has lowered the importance of smokestack industries with slow growth and heavy cycles.

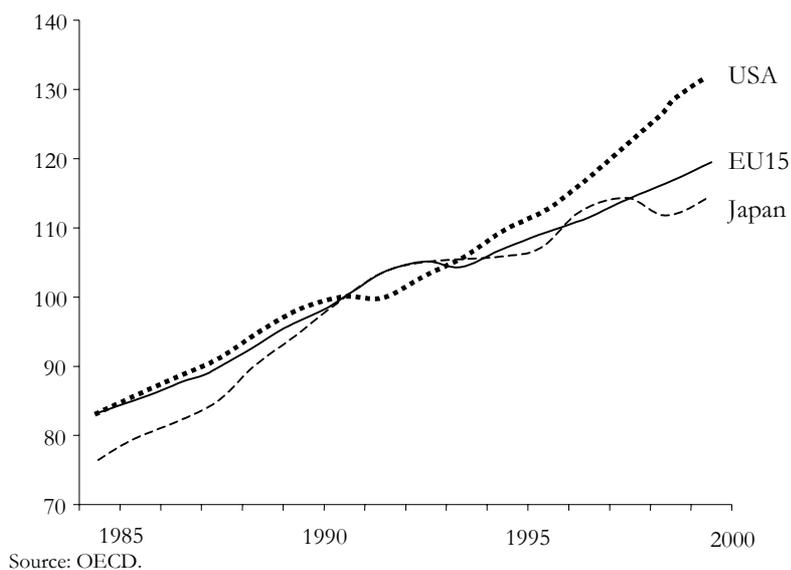
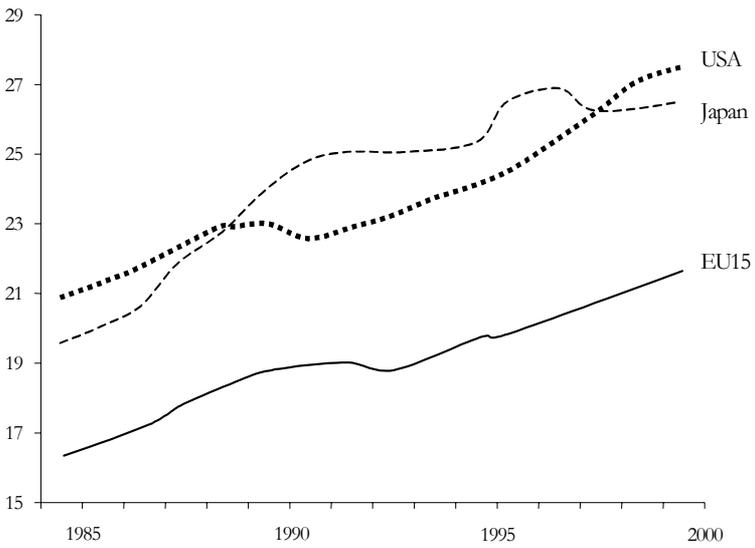


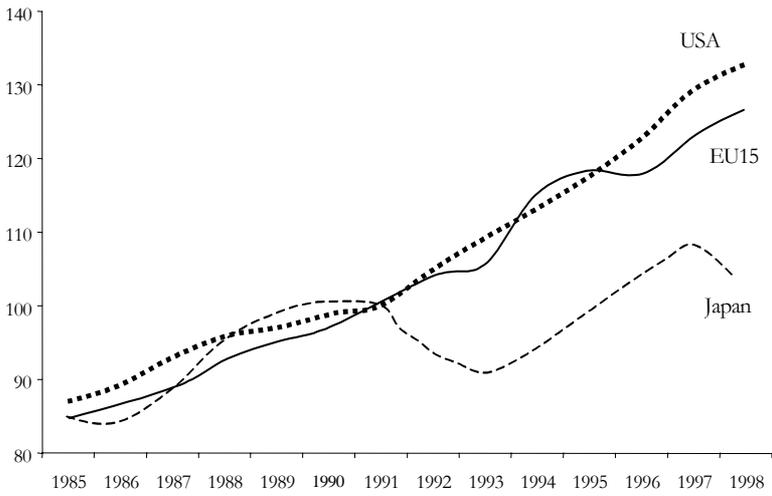
Fig 1: Growth of real GDP (1990 = 100)

A third explanation for the increasing difference is that the speed of change is too slow in Europe. For social and cultural reasons changes take longer there. One dimension of alteration is the change in the structure and location of industries. Industries are much more regionally concentrated in the USA and European integration was expected to increase concentration. The next chapter investigates the changing nature of integration in Europe over the past 10 years.



Source: OECD.

Fig 2: Per capita income of the EU, Japan and the USA



Source: OECD.

Fig 3: Growth of productivity in manufacturing (real value added per employee)

III. Regional integration: forecasts and facts

Regional concentration is a particularly fascinating topic. At the theoretical side the surge of New Economic Geography provides new

models for regional concentration, above all the forecast that lowering transport cost will first lead to higher concentration but finally, if congestion forces dominate, to dispersion again. Secondly comparing Europe with the USA shows that the USA is much more highly concentrated. This leads to the prediction that Europe might concentrate regionally if integration goes on. Thirdly there are political fears that total activity or at least most attractive activities like research and development might concentrate in the core, leaving the periphery behind in income and growth. Finally the European Monetary Union has raised the question whether countries will be able to damp asymmetric shocks that could aggravate if regional concentration of specific industries increased. The current paper, which is an offspring of a medium term research programme on specialisation and concentration of industries presents stylised facts about the development in the last 10 years¹. The main finding is that regional concentration had not been rising over the past years and the fears that Europe could become as concentrated as the USA are unfounded. If anything happened at all, the shares of large producing countries and that of the core were decreasing. But in general structural change is slow in Europe.

3.1 Defining concentration

We define concentration as the share of the leading countries in the individual industries. The distribution of the production share of countries can be assessed by simple indicators, like the share of the largest 3 of 5 countries, or more sophisticated summary measures like *Herfindahl*- or *Gini*-standard-deviations can be used. Independent from the indicator chosen high concentration of production or of exports means that a few countries supply a large part of a given sector (industry). Low concentration or dispersion means that a sector or an industry is evenly spread across the member states. An evenly spread structure (low concentration) has two benchmarks: it can either mean that in a specific industry each country supplies an equal share of industry output. This is called an absolute perspective. Evenly spread can also mean that in a given industry all countries contribute proportionate to their size (measured by shares in total manufacturing): This is called a relative perspective. Indicators measuring concen-

¹ This research programme was commissioned by the European Commission, DG Enterprise; a large part of the results in this paper was published in European Union (1999).

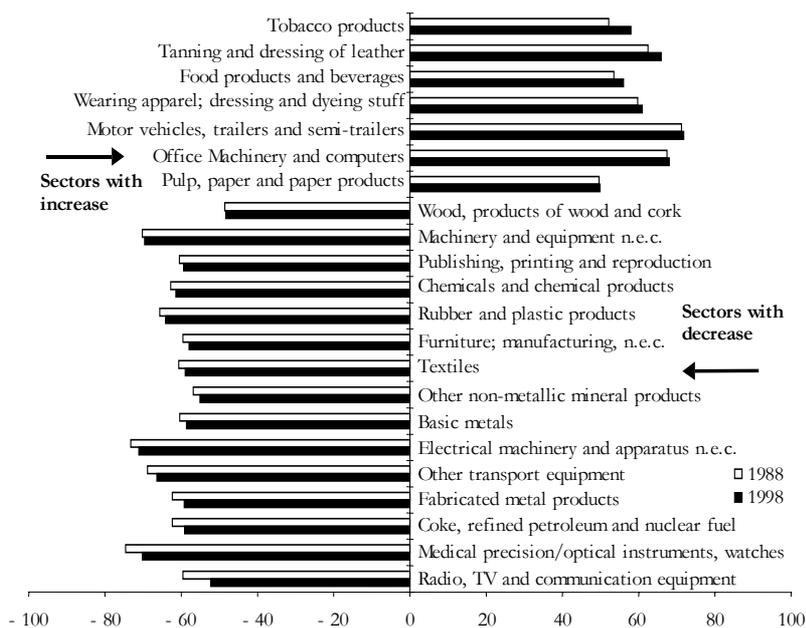
tration from the absolute perspective are called indicators for “absolute concentration”, indicators which take country size explicitly into account are called indicators on “relative concentration”. From the indicators we use, the first four emphasise the absolute position, the others the relative position. Although this may sound rather technical, its importance is evident since absolute indicators implicitly focus on large countries (which have the largest absolute shares in most industries). Relative indicators focus on the development of small countries, whose shares in individual industries deviate usually stronger from total manufacturing. A complete picture needs both indicators, since they answer different questions.

3.2 Shares of large producers decline

The analysis of production- as well as trade-data shows that geographic concentration was significantly lower in 1998 than in 1988 as far as absolute concentration is concerned. If we use indicators stressing the role of small countries, production concentration increases in the majority of sectors and industries. Export concentration declines faster than production concentration. The decline in absolute concentration of exports is strong enough to avert the opposite tendency for relative indicators. Large surpluses and large deficits in industries level off.

Part of the analysis on geographic concentration of industries overlaps with that on the specialisation of countries, since specialisation of countries and concentration of industries are two ways to interpret the pattern of economic activity performed in countries and industries. We therefore focus rather on the question which industries are becoming more or less concentrated and what forces are behind these processes, than asking in which countries specific industries concentrate.

Motor vehicles, electrical machinery and machinery are the most highly concentrated sectors. In these sectors 70% of European value added is generated in three countries. Germany supplies the largest production share in each sector, with France, United Kingdom or Italy alternatively complementing the top 3 countries. Office machinery and other transports are also heavily concentrated. In all these sectors the leading five countries produce together about 85% of the total EU output. However out of these heavily concentrated sectors, only the motor vehicles-sector has increased its regional concentration in the past years.



Source: WIFO calculations using SBS.

Fig 4: Geographic concentration of production (sectors): 1988-98. Share of the largest three producers (countries): CR3

Least concentrated are wood, pulp and paper, food, mineral products and telecom equipment, here about 50% are produced in three countries and about 70-75% in five countries. Concentration is decreasing in most of these industries, strongly in telecom equipment, where Germany and Spain lost while Sweden and Finland have increased their shares. In food industry the concentration is increasing, due to larger market shares of Germany and the United Kingdom.

Geographic concentration of production as measured by CR5 has increased only in four out of 22 sectors: tobacco, food, plastics, and other transport equipment. As measured by the share of the largest three producers (country) absolute concentration has grown in seven sectors. The unweighted average of the concentration rate over all sectors has declined by 0.9% for the top three countries and 1.6% for the top five countries. On the three digit level we see a lot of mobility, but the pattern is similar: concentration rates decline in two thirds of the industries, the weighted average drop amounting to about 1.2% (for top three and top five). The largest increases occurred in reproduction of media, which is concentrated in Ireland and in Austria.

Other increases are reported in a small basic steel sub-industry², and in the weapons and ammunition industry (United Kingdom, France). The games and toys-industry is geographically concentrated in Germany, Denmark and United Kingdom, three textile industries in Italy and partly Spain. In three industries the increase in concentration (CR5) was larger than five points and none of these belong to the ten most concentrated even after this increase. On the other hand, concentration has decreased in 13 industries by more than 5%. Some of them are high tech industries like telecom industries, medical equipment and process control.

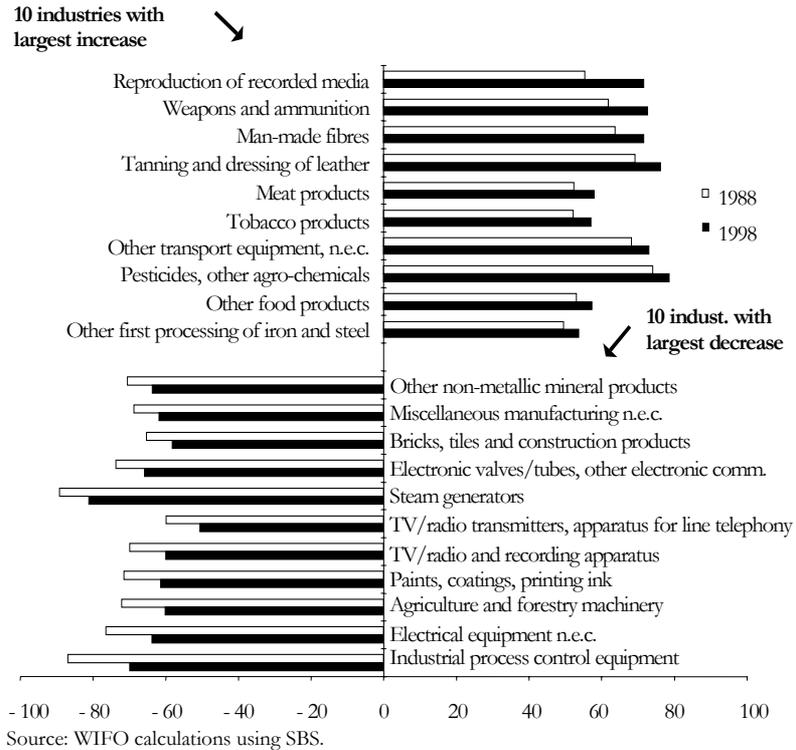
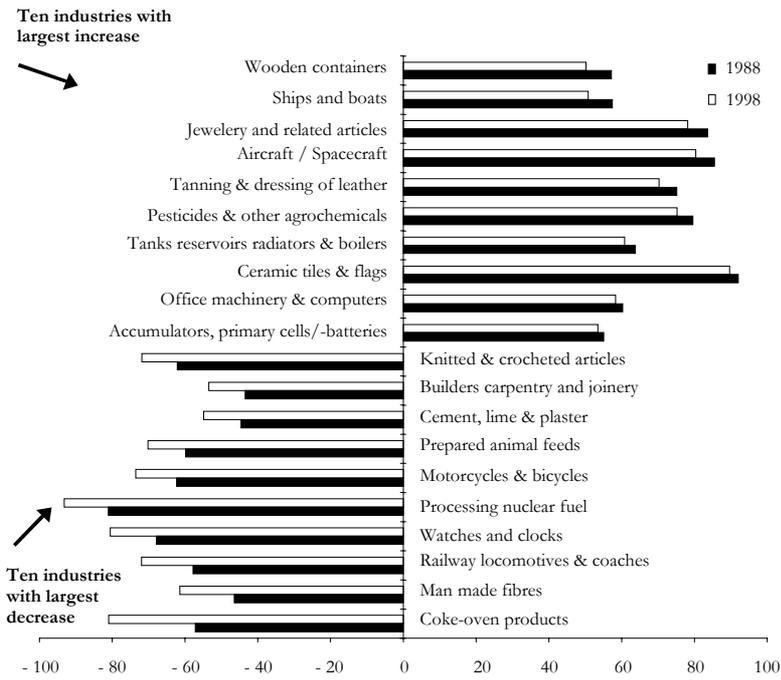


Fig 5: Geographic concentration of production (industries) 1988-98.
Share of the largest three producers (countries): CR3

² "other first processing of iron", which is concentrated in Italy and France.



Source: WIFO calculations using COMEXT.

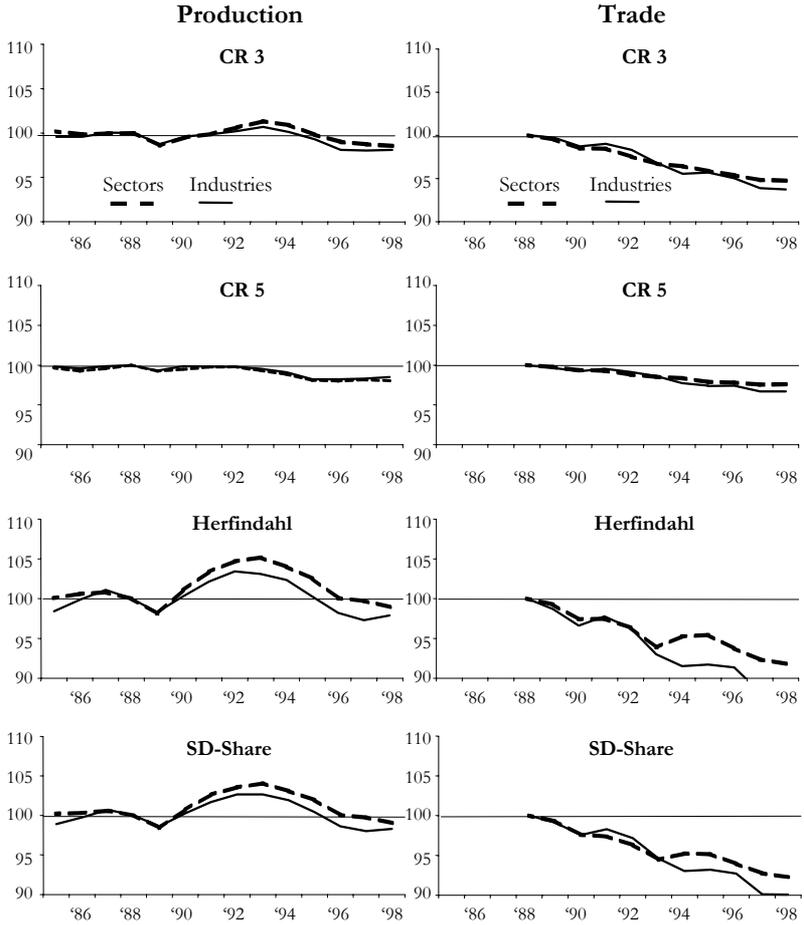
Fig 6: Geographic concentration of exports (industries) 1988-98.
Share of the largest three producers (countries): CR3

3.3 The role of small countries for indicators of relative concentration

The specialisation rate (or location rate since we focus on geographic concentration) compares the share of a country in a specific sector with its overall share in manufacturing. The dissimilarity indicator (sum of absolute difference) adds up differences in the shares of a specific industry from those in total manufacturing. Both indicators highlight the role of small countries since one large firm (or a few large firms) usually produces more than the small average “market share” of a small country. Economically, high specialisation rates of small countries derive from the fact that minimum efficient scale, while not too large in relation to total European demand, is often large relative to the average market share of a small country. This effect is also called lumpiness of investment.

The specialisation rates increase in 17 out of 22 sectors, the dissimilarity index in 16. Relative production concentration is increasing in the majority of the industries, too. Specifically we find two industry groups in which absolute and relative indicators diverge strongly.

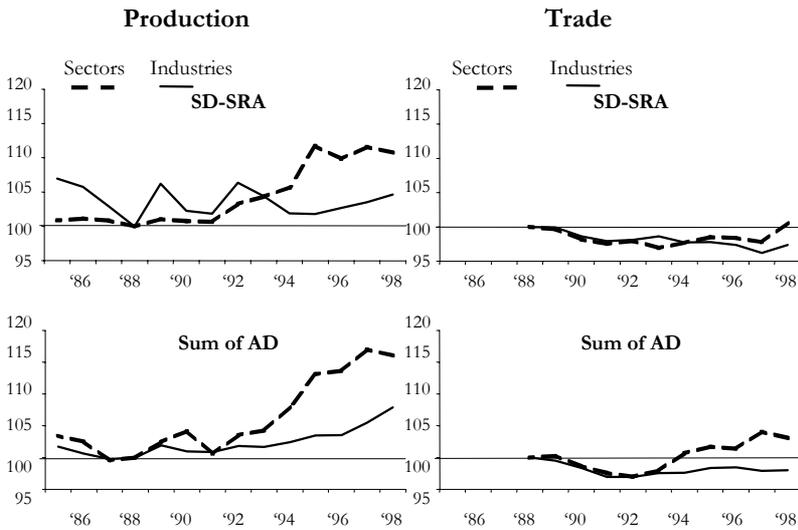
The first are textile industries. Textile industry and apparel industry have below-average concentration rates but are among the top specialised sectors represented by location or dissimilarity indices. Concentration is to decrease if we measure the share of the top five countries and to increase if we calculate relative indicators. The reason for this is that Italy and Austria in textiles and Portugal in apparel have higher shares in these industries than in total manufacturing. The large countries like Germany, France and the United Kingdom have reduced their shares, thus increasing their negative specialisation and becoming less similar to the total.



Remark: Composite indicator (indicators are indexed, unweighted average).

Source: WIFO calculations using SBS and COMEXT.

Fig 7: Concentration trends in production and trade (Part I)



Remark: Composite indicator (indicators are indexed, unweighted average).
 Source: WIFO calculations using SBS and COMEXT.

Fig 7: Concentration trends in production and trade (Part II)

	Increase in	Dissimilarity		Decrease	CR 5		Top 3	Top 3 losers
	dissimilarity	level		in CR 5			winner	
	'98-'88	'98	'88	'98-'88	'98	'88		
Wearing apparel; dressing and dyeing of fur	20.36	54.96	34.60	-1.16	84.77	58.93	IT, PT, BE	DE, FR, UK
Radio, TV & communication equipment	15.74	35.03	19.29	-6.64	72.30	78.94	FI, SE, BE	DE, ES, NL
Office machinery & computers	12.60	50.31	37.71	-3.26	86.61	89.87	UK, IE, NL	IT, FR, DE
Tanning and dressing of leather	13.82	75.85	62.03	-1.79	86.94	88.73	IT, PT, ES	UK, DE, FR
Textiles	9.32	45.49	36.18	-3.88	78.87	82.75	IT, BE, AT	DE, FR, ES

Top 3 winners (losers): countries with largest gain (decline) in total value added of the sector in the EU.

Dissimilarity: sum of absolute differences of country share in specific sector from country share in total manufacturing.

Source: WIFO calculations using SBS.

Table 2: Where absolute and relative concentrations differ

The second group are three high tech sectors in which location decisions and headquarters of large multinational firms play a role: office machinery, telecom equipment and medical instruments are high tech sectors in which absolute concentration decreases and relative con-

centration increases, this is also the case for reproduction of recorded media on the industry level. In the first and last case the inroads of Ireland play a major role, in telecom equipment those of Finland and Sweden, in medical equipment it is Denmark, Ireland and again Sweden and Finland which have pushed up indicators of relative concentration, while Germany's losing market shares has contributed to lower absolute concentration.

The five sectors with the largest increase in relative concentration (as opposed to absolute concentration) are rather small sectors.

3.4 Geographic concentration of exports declines

Concentration decreases substantially because exports and trade imbalances across countries are shrinking. The shares of the largest three countries in a typical sector have decreased by 3.2% and 4.0% in the average of industries. Only in two sectors absolute export concentration has increased: in office machinery due to the inroads of the Netherlands and Ireland and other transport equipment due to the gains of France, Italy and the United Kingdom. On the industry level the highest export concentration rates can be observed in processing of nuclear fuel, and aircraft and spacecraft, in two leather industries and some resource related industries (bricks, tobacco, jewellery). Increases in concentration are reported in one quarter of the industries, the largest in leather, wood containers and bricks, as well as in pesticides, ships and boats and air- and spacecraft. The more robust decline of export concentration downgrades the conflicting evidence between absolute and relative concentration indicators, but the main pattern of increasing relative concentration in the textile industries and some high tech industries remains. For the majority of industries even the relative indicators show declining concentration, underlining the picture drawn by absolute indicators. The highest export concentration rates are reported in pulp and paper, wood, leather, apparel and office machinery, the largest increases in chemical industry, publishing and printing and in tobacco. The regional imbalances of exports and imports of countries in specific industries – as measured by the decline in the Revealed Comparative Advantage-value (RCA).

3.5 Summary for concentration trends

The overall picture is one of decreasing absolute concentration. This dispersion trend is stronger for exports than for production. Indicators in this group focus on absolute size and therefore implicitly on the position of larger countries. Indicators of relative concentration, which implicitly focus on the smaller countries, show an increase for production concentration. Different trends in absolute and relative

concentration can be seen (i) in the textile sector, where southern countries increase their share, (ii) in high tech industries where small countries host successful multinational firms or profit from foreign direct investment. The main difference between indicators on absolute and relative concentration arises in small sectors or industries in which small countries produce a large share. Concentration of labour-intensive industries is one reason for that, indivisibility of plants and the size of large firms another. Historically, large trade imbalances decrease; exports are becoming less concentrated by absolute measures, and for relative measures on the industry level.

IV. The underlying forces of changing concentration

Theory suggests that production and location decisions depend on such variables as spillovers, economies of scale and specific inputs, on the relation between fixed and variable costs, and on the degree of product differentiation. Trends should therefore differ, depending on the industry type and region. We investigate which trends are reflected in the data, and specifically whether integration has been asymmetrical, favouring the core. Secondly, we investigate which role foreign direct investment plays in shaping the dispersion and concentration of industries. Thirdly, we look at whether the trend of increasing *intra*-industry trade continues, whether countries with lower shares are catching up, and whether the horizontal or vertical components dominate.

4.1 Characteristics behind the trends for de-concentration

Convergence across industry types

The level of concentration has been historically higher in research-intensive and in skill-intensive sectors. This is well in line with modern theory, which stresses spillovers and pooled labour markets in dynamic industries. In both groups, however, geographic concentration is declining.

The WIFO taxonomy³ classifies industries according to factor intensities into labour-intensive, capital-intensive, research- and adver-

³ First applied in: EU-DGIII Report on the Competitiveness of European Manufacturing 1998 (Part 2: Manufacturing, provided by K. Aiginger, St. Davies, M. Peneder, M. Pfaffermayr), Brussels, 1998. For the methodology see: M. Peneder, Intangible Investment and Human Resources. The new WIFO Taxonomy on Manufacturing (= WIFO Working Paper 114), Vienna 1999.

tising-intensive sectors. It has as a fifth segment a mainstream sector, which uses the average mix of factors.

The research-intensive sector is the most concentrated sector. In a typical research-intensive industry, the largest three countries produced 71.6% of the EU output in 1988; this share now amounts to 68.8%. This decrease in concentration in the research-intensive sector has been more rapid than the average in the other sectors. Concentration has been declining specifically in process control equipment - where France, Italy and Finland have made gains - in the audio and video and the telecom industries - in which Finland, Sweden and, in part, Austria and Belgium have increased their shares - and in the pharmaceutical industry - where Ireland has made some inroads.⁴ Significant increases in concentration are evident for two chemical industries (agro-chemicals and other chemicals, where Germany and the United Kingdom have both increased shares), in electronic components (Germany and Italy), and in office machinery (Ireland and the Netherlands).

	CR 3		SD SRA		Dissimilarity index		Largest share '98			Largest gain '98-'88		
	'88	'98	'88	'98	'88	'98						
Pesticides, agro-chemicals	74.1	78.5	0.48	0.48	81.86	66.69	UK 34%	FR 28%	DE 17%	PT + 18%		
Other chemical products	58.4	62.5	0.36	0.36	28.55	26.60	DE 29%	UK 19%	FR 15%	UK + 4%	IE 4%	
Office machinery and computers	67.5	69.8	0.49	0.57	38.02	53.75	DE 32%	FR 25%	IE 14%	IE + 9%	NL + DE + 9%	DE + 6%
Motor vehicles	71.3	73.2	0.44	0.43	33.46	34.31	DE 46%	FR 14%	UK 13%	DE + 5%	UK + 1%	BE + 1%
Electricity distribution and control apparatus	84.9	85.5	0.30	0.26	76.33	77.56	DE 69%	FR 11%		FR + 1%	DE + 1%	
Optical instruments & photo equipment	73.5	73.6	0.38	0.41	27.56	33.66	DE 33%	IT 24%	UK 17%	IT + 13%	IE + 1%	PT + 1%
Instrum. f. measuring, checking, tests, navigation	78.6	77.6	0.37	0.38	40.57	40.71	DE 31%	FR 28%	UK 19%	DE + 3%	SE + 2%	
Aircraft and Spacecraft	78.7	77.4	0.41	0.43	55.41	52.41	UK 32%	FR 23%	DE 22%	DE + 2%	SE + 1%	PT + 1%
Pharmaceuticals	58.9	56.7	0.18	0.26	24.18	25.95	FR 20%	DE 17%	UK 16%	IE + 3%	ES + 1%	

⁴ The losses in these sectors occurred in Germany (in the first two) and United Kingdom.

	CR 3		SD SRA		Dissimilarity index		Largest share '98			Largest gain '98-'88		
	'88	'98	'88	'98	'88	'98						
Medical equipment	66.4	61.3	0.40	0.42	37.76	33.01	DE	FR	UK	FR +	IE +	FI +
							38%	13%	11%	2%	3%	2%
Electronic valves, other electronic components	73.7	65.9	0.40	0.40	50.65	36.32	DE	UK	FR	DE +	IT +	IE +
							24%	22%	20%	6%	6%	2%
TV/radio transmitters, apparatus, f. line telephony	60.0	50.6	0.21	0.39	21.15	53.21	FR	UK	DE	FI +	SE +	
							19%	17%	15%	8%	6%	
TV, radio and recording apparatus	69.9	60.0	0.48	0.49	61.50	72.87	DE	UK		BE +	AT +	
							21%	13%		4%	4%	
Industrial process control equipment	86.9	69.9	0.42	0.47	57.75	35.33	DE	FR	IT 19%	UK +	FR +	IT +
							28%	23%		11%	8%	5%

SD SRA: Standard deviation of (adjusted) localisation coefficients

Dissimilarity index: sum of absolute differences of country shares for industry from that manufacturing.

Ranked according to change in CR 3

Source: WIFO calculations using SBS.

Table 3: Geographic concentration of production in research-intensive industries

Least concentrated is the advertising-intensive segment. Concentration has grown here slightly, but the top three share still is only 62.1%. The largest increases occurred in some food industries, as well as in publishing, the reproduction of recorded media (Ireland, Austria), in sports goods (United Kingdom) and in the games and toys industry (Denmark).

In the labour-intensive segment, concentration lies below the average and the trend varies across industries. The shares of the largest countries are increasing in many textile industries, but decreasing in construction-, transport-related industries and in electrical equipment. In the textile industries, the rising shares of Italy and Portugal result in high absolute and relative concentration, and an increase in the dissimilarity index. In four textile industries, Italy's shares account for about one third of Europe's value added (starting from about 20% in 1988). Portugal increased its share to 5%. The large increases in these countries' shares reflect the declining production in other countries, since Italy's and Portugal's shares of manufacturing for the apparel industry are roughly constant.

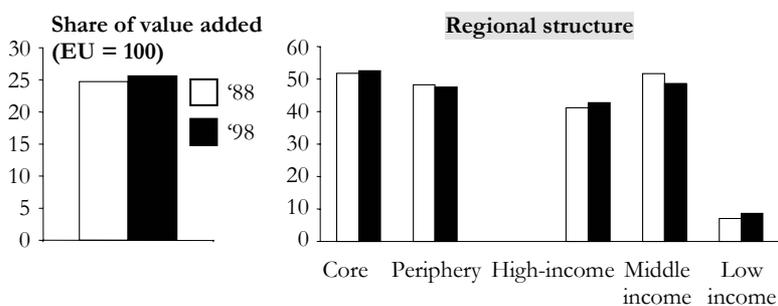
If we divide industries according to skill classes, we see the same convergence. Concentration is higher, but declining in the highest skill class. It is low in the low skill industries, in which absolute concentration is almost constant.

The core - periphery pattern

Economic geography stresses the importance of a core region, where dynamic economies of scale can be exploited, while the role of the periphery depends on trade costs, factor costs, mobility and trade barriers. The importance of market access, market size, income levels and sometimes also of a North-South split is discussed in the literature on economic geography.

Having chosen a classification of countries that defines about one half of manufacturing as core and one half as periphery, we find stable shares of production over time. Roughly 50% of manufacturing was produced in the core and 50% in the periphery in 1988, as well as in 1998.⁵ Some of the peripheral countries like Ireland, Portugal and Greece are winning value added shares (at different degrees). Sweden and Finland have lost shares, following a rather difficult period of restructuring during the ten years on which the analysis is focusing.

Mainstream industries

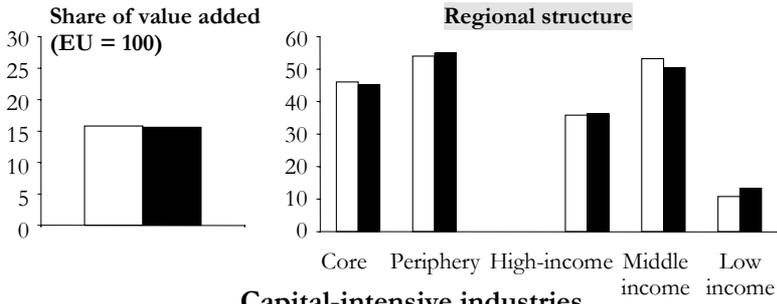


sollte das "Regional structures" heißen?

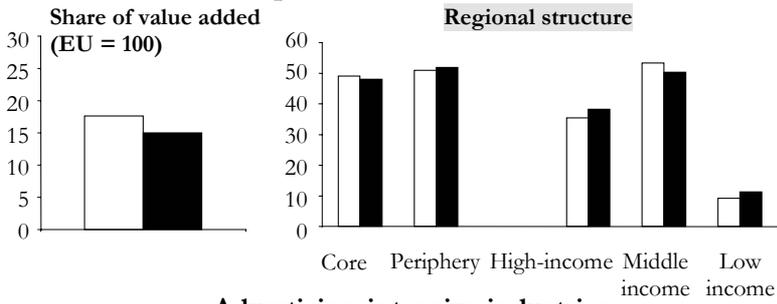
Fig 8: Industry types and geographic structure (Part I)

⁵ Dividing the member states of the European Union into core countries and periphery to parallel models of economic geography is not an easy task, since some countries comprise core as well as periphery areas (Italy, United Kingdom). We defined Belgium, Denmark, Germany, France and the Netherlands as core. The main results remain the same if we switch the above-mentioned two countries from the periphery to the core. Details of the results, however, slightly depend on the indicators used. The share of the core is stable if we take the weighted average (or absolute value added); if we take unweighted averages of the market shares, the core loses and the periphery wins (since the periphery has higher market shares in smaller industries and small industries are growing at high rates in small countries). Note that we define industry characteristics; e.g. pharmaceuticals are classified as research-intensive. This does, of course, not mean that a specific plant in this industry in a specific country may not have a research department.

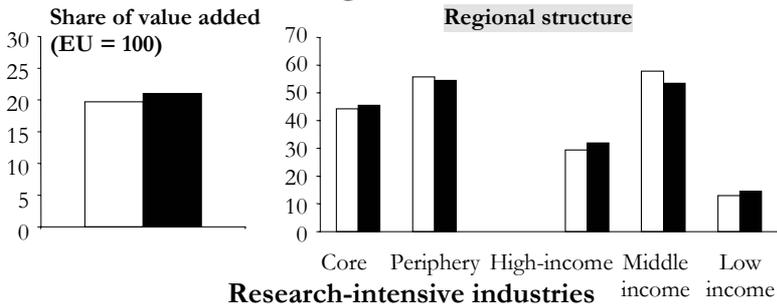
Labour-intensive industries



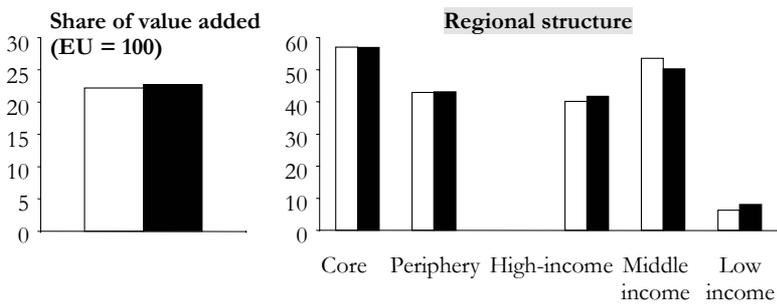
Capital-intensive industries



Advertising-intensive industries



Research-intensive industries



Source: WIFO Calculations using SBS

Fig 8: Industry types and geographic structure (Part II)

The core has its largest market shares in the research-intensive sectors, although its share decreased in a typical research-intensive industry [?] from 58.2% to 57.0%. The shares of the United Kingdom decreased and those of Ireland and Finland increased. The core made its largest gains in electric components (where Italy and Germany won shares), and pesticides (which shifted from Austria, Spain and Finland to Germany). The periphery made its greatest inroads in telecom equipment, control equipment and optical instruments. Considerable progress was also made in audio and video, aircraft and spacecraft. Low-income countries, the South and specifically small countries increased their shares in research-intensive industries (without reaching the average).

The core produces less than half of the value added of some advertising-intensive industries. The industries in which the core managed to increase its share were publishing, games and toys, some food industries and beverages. Germany and the Netherlands increased their market shares, the losses for the periphery occurred in the Scandinavian countries and Italy.

In the labour-intensive industries, the typical market share of the core is low, and decreased only marginally (- 0.3% to 45.7%). From a country perspective, Germany's share dropped, while the shares of Spain, Portugal and Italy in this segment increased. Spain increased its shares in transport- and construction-related industries; Italy in textiles and machine tools; Portugal in wood, apparel and some engineering industries. In all these cases, the peripheral countries won, not only in narrowly defined low cost industries.

In capital-intensive industries, the core and periphery have stable shares, partly at variance with the prediction that these industries would try to maintain and upsize plants in the centre. The core increased its shares in basic metals, cement and textile fibres, but lost larger shares in basic chemicals, pulp and paper, and tiles and flags. From the country perspective, France and the Netherlands decreased their shares in capital-intensive industries, and Ireland had the greatest increase (e.g. basic chemicals).

The core lost 4 percentage points in total exports, with no differences between *extra-* and *intra-*EU exports.⁶ The industries that contributed to this trend were capital-intensive industries (coke, nuclear fuel, and basic chemicals), as well as textile industries, audio and video

⁶ The share of the core is now 57.6% of total exports, 55.7% for *extra-*EU and 58.8% for *intra-*EU (weighted data).

and telecom equipment. The core is losing exports in research-intensive industries, but to a smaller extent than for total exports. From the country perspective, the loss of the core results from the decreasing market shares of Germany and to a slighter degree of the Netherlands; the gains for the periphery are provided by Ireland, Spain, and the United Kingdom.

Income, country size, North - south pattern

The core-periphery dichotomy was based on regional criteria⁷. Dividing the member states according to per capita GNP (at Purchasing Power Parity (PPP)) creates a pattern in which middle-income countries lose shares, high-income countries make small advances, and low-income countries gain strength. This split is particularly distinct in advertising-intensive countries in which middle-income countries have had an over-proportionate share and have now regressed to the average. For the labour-intensive segment, the same loss has been witnessed in the middle-income countries, while the share of the low-income countries has increased. The rising shares of the high-income countries in the labour-intensive segment nevertheless are a surprise. While high-income countries lost shares in the apparel industry as was expected, some high-income countries, such as Germany, increased their production of construction material. In the research-intensive segment, the shares of the high-income countries are expectedly over proportionate, but not by a large margin. The low-income countries have caught up by 2% and now represent 8% of the value added generated by the industries in this group. Measured according to exports, the high-income group lost for the benefit of the other two groups.

⁷ We applied the following classification:

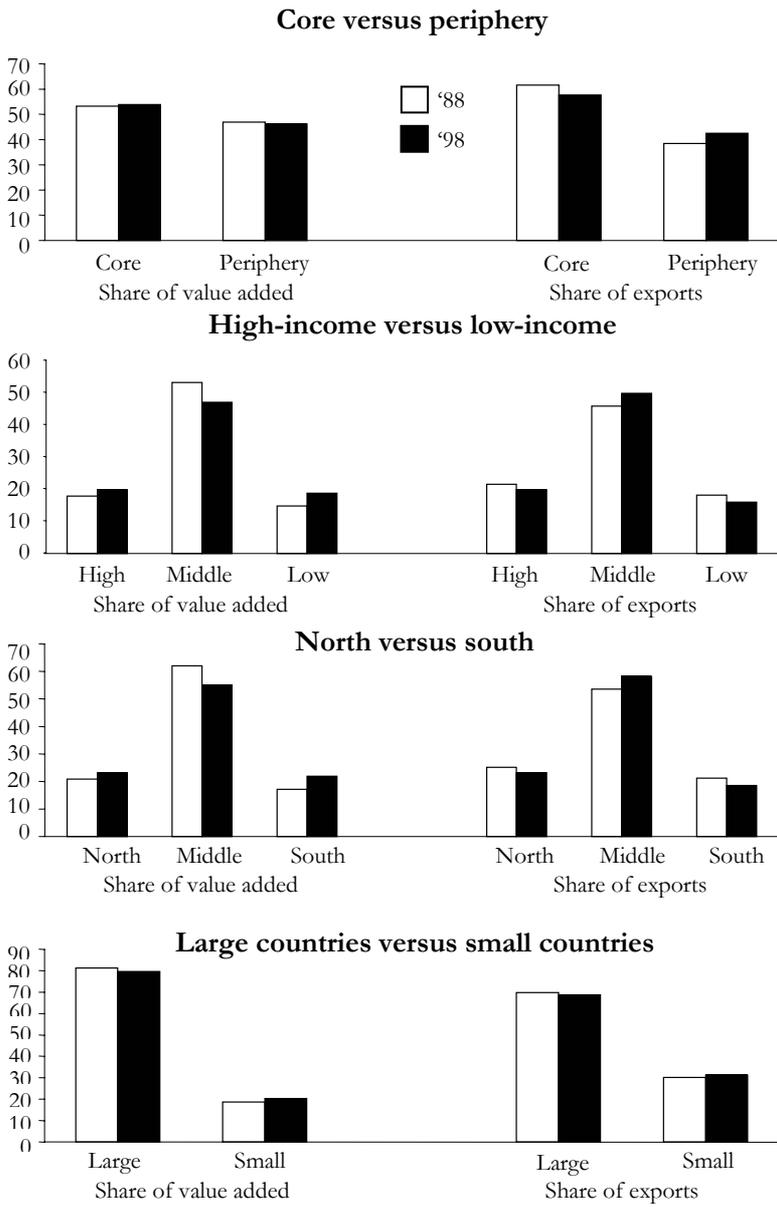
Core: BE, DA, DE, FR, NL. Periphery: Others.

High-income: AT, BE, DA, DE. Middle income: FI, FR, IT, NL, SE, UK. Low-income: EL, ES, IE, PT.

North: DA, FI, IE, SE, UK. Middle: BE, DE, FR, NL. South: EL, ES, IT, PT.

Large: DE, ES, FR, IT, UK. Small: Others.

For the core we checked the differences if United Kingdom and Italy were shifted to the core.

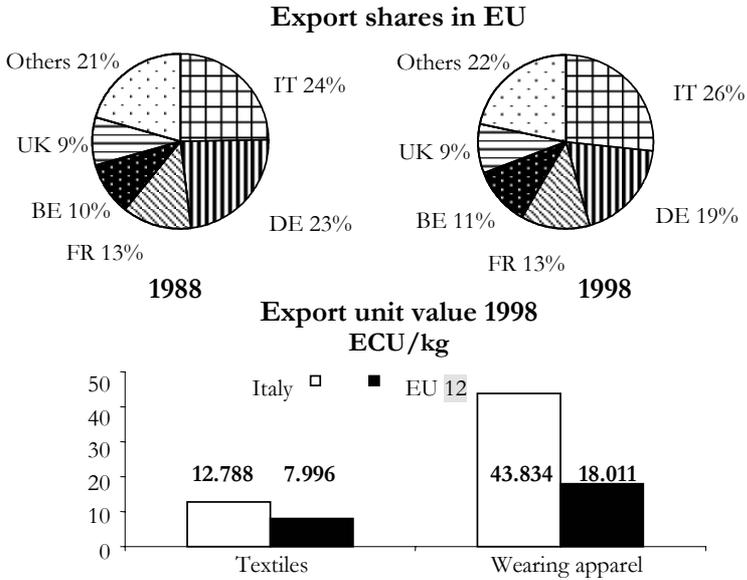


Source: WIFO calculation using SBS

Fig 9: Geographic concentration of production and exports

North versus South is a distinction made in many theoretical studies, primarily from the US, implying that the South is specialised in labour-intensive industries, while the North is innovative, specialised in

research driven industries and those with significant product differentiation. In Europe, the North produces 19.4% of the output in typical labour-intensive industries (1998), having reduced its share by 4.0%. The South produces 32.8%, having increased its share by 3.5 percentage points during the last ten years. A considerable amount of production in the research-intensive industries can be attributed to the North, although its share increased only marginally. The South increased its share in typical research-intensive industries by 0.9%.



Source: WIFO calculations using SBS

Fig 10: Italy as market leader in textiles

Large countries produced 79.6% of value added, their share decreased by 1.7 percentage points. The decline is due to the lower shares of Italy and the United Kingdom, while the shares of Belgium, Austria and Ireland increased. The share of large countries in research-intensive and in skill-intensive industries is over proportionate, but declined typically by 3.0% points. The same tendencies hold true for exports. The share of large countries in capital-intensive industries is below average.

The influence of other determinants

Concentration is greater in industries with high multinationality although it decreased in these industries between 1988 and 1998 by two percentage points. There are only three industries with high de-

degrees of multinationality in which concentration rose: the reproduction of recorded media, other chemicals and other food. Large decreases in control equipment, audio and video, telecom equipment, electronic components, electrical equipment and ships and boats resulted in the dominance of declining regional concentration.¹

It is to be expected that integration will enable a stronger exploitation of economies of scale² (EOS). Data show that industries with larger economies of scale are regionally more concentrated, but the difference to average concentration is rather small (about one percentage point) and the indicator of the minimum efficient scale (MES) does not show the same trend. For both indicators, concentration declines somewhat less in the two groups with high EOS and MES. Among the industries with strong economies of scale we find increasing concentration in other transport equipment, other chemicals, other food, and agro-chemicals. There are, however, also industries with increasing returns, like electrical equipment, basic iron, and paints, where regional concentration is declining.

Industries with high market growth are less regionally concentrated, average concentration is 64.3% in those with high growth and 65.9% in those with low growth. Regional concentration declined in both groups between 1988 and 1998. Concentration is six percentage points higher in the group of highly globalised industries, but no difference in degree of decrease between 1988 and 1998 is given for highly and lowly globalised industries.

¹ *Davies and Lyons* (1996) classified industries according to the multinationality of their leading firms, the indicators roughly reflect the number of countries in which they produce as an indicator. The indicators had to be reclassified from old to new NACE (Nomenclature générale des activités économiques dans la Communauté Européenne = general system of sectors of economy in the EC) by WIFO.

² As indicators for EOS, we use data from *Davies and Lyons* about Minimum Efficient Scale (in relation to industry size, MES) and *Pratten's* (1988) classification into EOS classes according to a set of indicators.

	CR3 '88	CR3 '98	CR3 '98-'88	CR5 '88	CR5 '98	CR5 '98-'88
High market growth	64.05	62.34	- 1.72	82.46	81.55	- 0.91
Medium market growth	64.70	63.33	- 1.37	83.23	81.55	- 1.68
Low market growth	65.91	65.31	- 0.60	83.64	82.44	- 1.20
High globalisation-degree	67.37	66.35	- 1.02	85.23	83.86	-1.37
Med. globalisation-degree	66.01	64.44	- 1.58	84.50	82.82	-1.68
Low globalisation-degree	61.28	60.19	- 1.09	79.59	78.85	- 0.74
High multinationality	66.47	64.49	- 1.97	82.09	81.32	- 1.32
Medium multinationality	65.17	63.66	- 1.51	83.06	81.66	- 1.39
Low multinationality	63.02	62.82	- 0.20	82.73	81.64	- 1.09
High minimum efficient scale	63.53	62.94	- 0.58	82.09	81.32	- 0.77
Med. minimum efficient scale	65.10	63.82	- 1.28	83.05	81.16	- 1.89
Low minimum efficient scale	66.03	64.21	- 1.82	83.94	82.61	- 1.33
High economies of scale	64.90	64.51	- 0.39	83.32	82.92	- 0.40
Med. economies of scale	66.10	63.50	- 2.60	83.05	81.16	- 1.89
Low economies of scale	63.66	62.97	- 0.69	82.95	81.45	- 1.51
High product differentiation	68.67	66.50	- 2.17	85.64	83.85	- 1.79
Med. product differentiation	65.48	64.88	- 0.60	84.23	83.77	- 0.46
Low product differentiation	60.51	59.60	- 0.91	79.46	77.91	- 1.55
High productivity	63.34	63.19	- 0.15	81.68	80.87	- 0.81
Medium productivity	67.54	64.88	- 2.82	84.36	82.95	- 1.41
Low productivity	63.78	63.07	- 0.71	82.28	81.71	- 1.57
High wage level	68.08	67.69	- 0.39	84.84	84.32	- 0.52
Medium wage level	65.42	62.94	- 2.48	82.98	80.98	- 2.00
Low wage level	61.16	60.35	- 0.81	81.50	80.23	- 1.27
Low skill industries	55.9	54.8	- 1.08	79.7	78.3	- 1.37
Med. skill/blue collar workers	64.2	62.5	- 1.71	83.4	82.4	- 1.00
Med. skill/white collar workers	63.3	61.3	- 1.91	79.7	77.5	- 2.13
High skill industries	66.5	63.7	- 2.79	85.41	82.2	- 2.89

Source: WIFO calculations using SBS.

Table 4: Industry characteristics and concentration trends

High wage industries are significantly more concentrated, and their concentration was not reduced over the last ten years. Within the high-wage group, there are some capital-intensive industries (like agro-chemicals and steam generators), as well as some engineering industries (like machine tools, office computers, production of recorded media). Exactly half of them increased, and half of them reduced regional concentration. Within the low-wage industries, most textile industries increased concentration; in industries producing semi-finished or less processed goods, concentration decreased. Industries with high product differentiation³ started from high levels of concentration which declined during the last ten years.

Summary

The evidence does not support fears that the single market would strengthen the core at the expense of the periphery. The share of total manufacturing in the periphery is stable, and qualitative indicators look even brighter for the periphery, since, for example in research-intensive industries the differences have become smaller. Theoretical models showed that lower transport costs could first favour the centre and at a later stage the periphery. Data are not sufficient to answer the question on which part of the U-curve European manufacturing is currently producing. Nevertheless, data are more consistent with the possibility that Europe is eventually reaching the second side of the U. The periphery is catching up in several indicators (exports, research-intensive industries) and the low-income countries are making inroads in skill- and research-intensive sectors. However, we should take into account that the period analysed is short and that the results for countries should be complemented by an analysis on the regional level.⁴

³ As an indicator of product differentiation we used the standard deviation of export-unit values. See *Aiginger (1997)*.

⁴ For the classifications applied, please refer to note 7.

Box: Indicators, formulas, and notations (part I)

We denote values (production and exports) by X and shares by s . The index i refers to industries (e.g. 95 NACE 3 digits, or 22 NACE 2 digits), j to countries (14 member states of the EU, Belgium and Luxembourg treated as one) and t to time (1988 to 1998). Below we define several measures of specialisation and geographic concentration. To simplify notation we define (note superscript S is for specialisation measures, C for geographic concentration):

$$s_{ij}^S = \frac{X_{ij}}{\sum_{i=1}^I X_{ij}}, s_{ij}^C = \frac{X_{ij}}{\sum_{j=1}^J X_{ij}}, s_i = \frac{\sum_{j=1}^J X_{ij}}{\sum_{i=1}^I \sum_{j=1}^J X_{ij}}, s_j = \frac{\sum_{i=1}^I X_{ij}}{\sum_{i=1}^I \sum_{j=1}^J X_{ij}}$$

Indicator 1 and 2: the share of the largest n industries/sectors and the largest n country-shares in particular industries:

$$CR_{n,j}^S = \sum_{i=1}^n s_{ij}^S, i \text{ runs over the 3 or 5 largest sectors, and over the largest five 5 or 10 industries}$$

$$CR_{n,i}^C = \sum_{j=1}^n s_{ij}^C, j \text{ runs over the 3 or 5 largest countries}$$

Indicator 3: *Herfindahl*, sum of squared shares

$$H_j^S = \sum_{i=1}^I (s_{ij}^S)^2, H_i^C = \sum_{j=1}^J (s_{ij}^C)^2$$

Indicator 4: standard deviation of shares

$$STD_j^S = std_i(s_{ij}^S), STD_i^C = std_j(s_{ij}^C)$$

Indicator 5: specialisation rates

$$SR_j = \sum_{i=1}^I \frac{s_{ij}^S}{s_i}, CR_i = \sum_{j=1}^J \frac{s_{ij}^C}{s_j}$$

or since these measures are not symmetric

$$SRA_j = \frac{SR_j - 1}{SR_j + 1} \text{ and } CRA_i = \frac{CR_i - 1}{CR_i + 1}$$

now ranging between -1 and $+1$

In trade theory the specialisation rate SR_j is called *RCA-* or *Balassa-index*. In the literature of economics geography CR_i is usually called *localisation rate*.

Box: Indicators, formulas, and notations (part II)

Indicator 6: Dissimilarity index, sums up the absolute differences

$$SUM-AD_j^S = \sum_{i=1}^I |s_{ij}^S - s_i|, \quad SUM-AD_i^C = \sum_{j=1}^J |s_{ij}^C - s_j|$$

Indicator 7: *Gini*, when referring to specialisation, uses for each country the cumulated shares of industries in total manufacturing, after ranking and weighting, according to the specialisation ratio of industry i compared to the corresponding share of total EU. For concentration, the cumulated shares of countries in industry i are used, this time ranking and weighting by the country's share in industry i in relation to corresponding the country share in total manufacturing.

$$GINI_j^S = \frac{1}{2} \sum_{i=1}^I (ES_{ij} + ES_{i-1,j}) \frac{s_{ij}^S}{s_i} - \frac{1}{2},$$

$$GINI_i^C = \frac{1}{2} \sum_{j=1}^J (ES_{ij} + ES_{ij-1}) \frac{s_{ij}^C}{s_j} - \frac{1}{2}$$

ES_{ij} denote the cumulated sums of the shares s_{ij}^C and s_{ij}^S .

Indicator 8 (for trade only):

$$STD(RCA_{ij}) \text{ where } RCA_{ij} = \ln \left(\frac{X_{ij} / M_{ij}}{\sum_{i=1}^I X_{ij} / \sum_{i=1}^I M_{ij}} \right).$$

This is a "net trade RCA type" measure including imports (M_i) and exports (X_i). It has to be distinguished from a "Balassa type RCA", which uses exports only (see indicator 5).

V. Conclusions and policy implications

The process of European Integration (through the Single Market Programme as well as through the Monetary Union) was launched to increase income and welfare in Europe and to catch up with the US in productivity and efficiency. The fear existed that integration might increase the regional asymmetries within Europe. There is evidence that neither the hope for closing the gap to the US nor the fear of regional development to become more asymmetric are substantiated by fact in the past years.

Growth of GNP but also of manufacturing was definitely higher in the USA in the nineties. US growth since the middle of the nineties comprises extensive growth by increasing labour input, but also

intensive growth by increasing productivity. The growth differential is higher and for a longer period to be seen as stochastic or cyclical, but technological factors and maybe also macro economic facts (more expansive monetary policy) may play a role.

Fears of higher regional asymmetries had the following reasons:

- New growth theory predicted that differences in the accumulation of knowledge might cause long run divergence of per capita income and growth of countries.
- Economic geography predicted that lower transaction costs could tighten at least initially core periphery differences.
- Geographic concentration in the USA - the largest integrated market - was much higher than in Europe.
- The simultaneous trend of globalisation increased pressure on low wage countries.

However, empirical data show a robust tendency for exports to de-concentrate, for large imbalances to level off. Production concentration decreases in the sense that the shares of the large producers (countries) decline in many industries and in total manufacturing. Smaller countries increase their share in total manufacturing and make successful inroads in specific industries characterised by economies of scale and spillovers. In some industries they reach rather large shares relative to their size, but fortunately (as seen from the risk aspect) not only in one or two closely related segments but in a few industries. Thus industrial structures in the member states are becoming more dissimilar, but the picture is rather in line with the goal to make use of advantages than with creating asymmetries. The periphery does not fall back, if at all, it slightly decreases the gap in dynamic industries.

The shares of the more centrally located countries in value added have not risen over the past ten years. In order of being brief, we called the first group “core” and the non centrally located member states “periphery”, although these concepts are more appropriate for regions than countries. The result is robust to changes in the classification of countries. As to exports the core is losing market shares. As was expected, it has an over-proportionally large share of research-intensive industries, however, the share of the core in research-intensive industries is decreasing marginally (stronger for exports). The periphery made inroads in telecom equipment, control instruments as well as aircraft and spacecraft. In advertising-intensive industries, the core traditionally has had low shares, but has been increasing its share during the last ten years. Sport goods, music, games and some food industries are responsible for this trend. In the labour-intensive

industries, the periphery has been increasing its market share marginally. The increasing concentration of textile industries is complemented by labour-intensive sectors of the construction industry.

Fears of extremely fast and disadvantageous types of specialisation and concentration are not substantiated by the data. But note that we refer to the concentration of production in countries, not of firms, and not in regions. Extremely large imbalances in trade are evening out, highly concentrated industries tend to spread across countries, low-income countries and the periphery are catching up in endowments and in shares of fast moving industries. The strongest trend towards specialisation can be witnessed in Ireland, that has a favourable structure and growth performance. The vertical and horizontal division of labour within firms is increasing, high tech industries are not concentrating in the core, but are proliferating technology and skills. Labour-intensive industries are concentrating geographically, but not at high pace and in most cases not by increasing national shares, but rather by retreating slowly to low wage countries. At the same time, in the countries where labour-intensive industries are concentrating, a second group of industries is actively expanding in mainstream and engineering sectors. To remain competitive, firms in less dynamic industries are co-operating with low-wage countries, retaining the higher quality jobs and producing for the quality segment.

However, slow speed of change as a determinant of the recent poor performance of the European Economy also allows a positive prediction. Europe has changed its economic rules over the past years, increased its speed of liberalisation, privatisation, it has eliminated excessive budget deficits, and successfully launched the Monetary Union. This could mean that the transition to the "New economy" has only been delayed. The success of Europe in parts of information technology, specifically in the mobile telephone industry is remarkable. Mobile apparatus may in future prove to be the favourite route to the internet. Successes in other industries like security devices, or in aircraft and spacecraft indicate that Europe may regain the competitive edge again or at least narrow the gap towards the USA after political and economic reforms.

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