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Executive summary

This report gives an overview of patterns of structural change in Central and Eastern European economies over the decade 1989-1999. The analysis in this paper is restricted to a sub-sample of transition economies, namely the countries of Central and Eastern Europe (CEECs) – with the exception of the Baltic countries – which are currently also candidate countries for EU accession. While it would be interesting to extend the analysis to a wider range of transition economies, we were restricted by the use of a disaggregated database which allows reliable cross-country comparative analysis of patterns of structural change. Furthermore, we only deal with a subset of issues which come under the heading of 'structural change': the focus of the analysis is on changes in the structures of production, employment and in the positions of CEECs in the European division of labour, i.e. on the CEECs' international specialization.*

The structure of the paper is as follows: section 1 presents the broad patterns of sectoral change, i.e. the processes of deagrarization, deindustrialization and tertiarization which have taken place since the beginning of transition. Section 2 reviews some of the evidence on industrial restructuring and shows some interesting inter-country and inter-industry differences in this respect. Section 3 refers to the role which FDI plays in industrial restructuring and in the processes of industrial specialization of CEE economies. Section 4 reviews the developments of inter-industry and intra-industry specialization of CEECs in international trade with the EU. Section 5 refers to the evolving position of different CEECs in the European-wide division of labour and whether we can detect patterns of convergence in structure with different groups of EU economies. Section 6 reports the results of an econometric analysis of patterns of industry-level catching-up; the first part (6a) of this section deals with catching-up in productivity levels and wage rates, the second part (6b) with catching-up in product quality (measured by export unit values at a very detailed product level). Section 7 concludes with some remarks on the impact that EU accession might have on patterns of structural transformation and further East-West European integration.

Keywords: *Central and Eastern Europe, structural change, transition economies, industry, trade, foreign direct investment*

JEL classification numbers: *F02, F14, F21, L6, O4, O57, P52*

* The database upon which the analysis in this paper mostly relies is The Vienna Institute for International Economic Studies Industrial Database (WIIW-IDB).

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Structural Change in the Transition Economies, 1989 to 1999

Introduction

One should start a paper on 'structural change' in transition economies with a discussion, or at least a definition, of what one means by structural change. For the purpose of this paper I shall refer to structural change in two ways:

– changes in compositional structures (of output, employment, exports, etc.)

– changes in behaviour: we can think of this as changes in the ways how different variables relate to each other, such as output-employment relationships or FDI-export dynamic, etc.

The issue of structural change is, of course, of great relevance to transition economies as fundamental 'regime changes', particularly the systemic changes which transformed the basic principles of allocation decisions, as well as dramatic changes in external economic relationships (from a largely autarkic CMEA bloc towards external liberalization) induced structural changes in the above two senses. Furthermore, there are a number of relationships which attract the economists' interest in 'structural change':

– the relationship between 'economic structure' and the level of economic development

– 'economic structure' as an indicator of a country's position in the international division of labour

– 'structural change' as an indication of an economy's dynamism or lack of dynamism (and, in the case of transition economies, of the speed and direction of its transformation towards a well-functioning market economy)

We shall refer to all the above issues, although mostly not in a rigorous manner, in the following sections of this paper which point to some of the important structural features in transition economies and their developments over the past decade. The analysis in this paper is restricted to a sub-sample of transition economies, namely the countries of Central and Eastern Europe (CEECs) – with the exception of the Baltic countries – which are currently also candidate countries for EU accession. While it would be interesting to extend the analysis to a wider range of transition economies, we were restricted by the use of a disaggregated database which allows reliable cross-country comparative analysis of patterns of structural change.[1] Furthermore, we shall only deal with a subset of issues which come under heading of 'structural change': the focus of the analysis will be changes

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in the structures of production, employment and in the positions of CEECs in the European division of labour, i.e. on the CEECs' international specialization. We shall leave out important topics such as institutional change, changes in the geographic pattern of economic activity, micro-/firm-level changes and changes in income- and wealth-distribution. All these are essential issues in a fuller analysis of structural change in transition economies, but they cannot all be squeezed into one overview.

The structure of the paper is as follows: section 1 will present the broad patterns of sectoral change, i.e. the processes of deagrarization, deindustrialization and tertiarization which have taken place since the beginning of transition. Section 2 reviews some of the evidence on industrial restructuring and shows some interesting inter-country and inter-industry differences in this respect. Section 3 refers to the role which FDI plays in industrial restructuring and in the processes of industrial specialization of CEE economies. Section 4 reviews the developments of inter- and intra-industry specialization of CEECs in international trade with the EU. Section 5 refers to the evolving position of different CEECs in the European-wide division of labour and whether we can detect patterns of convergence in structure with different groups of EU economies. Section 6 reports the results of an econometric analysis of patterns of industry-level catching-up; the first part (6a) of this section deals with catching-up in productivity levels and wage rates, the second part (6b) with catching-up in product quality (measured by export unit values at a very detailed product level)[2]. Section 7 concludes with some remarks on the impact which EU accession might have on patterns of structural transformation and further East-West European integration.

1 Broad patterns of structural change: Deindustrialization – Tertiarization – De- (and Re-) agrarization

In this section we review shortly the patterns of structural change which took place in the CEECs at the broad sectoral level.

Figures 1.1 and 1.2 show the evolution over the period 1989 to 1998 of the shares of the three classical sectors (agriculture, industry, services) in value added and employment respectively (see also Table 1.1 in the Appendix); Figure 1.3 also allows a comparison of the sectoral composition between the CEECs and two groups of EU countries, the 'EU North' (composed of Belgium, France, Germany, UK) and the 'EU South' (composed of Greece, Portugal, Spain). We can observe the following tendencies:

2 The results reported in section 6 stem from joint research with Robert Stehrer and Johann Burgstaller; for a full report on this work, see Stehrer et al (1999).

De- and re-agrarization:

While there was a tendency in most of the CEECs to reduce the size of the agricultural sector, there are exceptions to this: in some economies the share of the labour force in agriculture (and in Romania even the absolute number) has increased; this is true for Bulgaria and Romania, while for all the other CEECs there are losses in the shares (and dramatic losses in absolute numbers) of agricultural employment. Interestingly, the economies with the larger agricultural sectors (Poland, Bulgaria, Romania) had smaller percentage declines (or even increases) in the employment shares of this sector, than the countries which started off with a smaller agricultural sector (Czech and Slovak Republics, Hungary, Slovenia). Hence, regarding the 'primary sector', the transition brought about processes both of 'deagrarization' as well as – in some countries – of 'reagrarization'. The second type of pattern should be considered a transitory phenomenon, resulting from the severe employment crisis in the industrial sector (especially in countries such as Bulgaria and Romania) and – so far – limited absorption capacity in the services sector. There are also interesting discrepancies in the movements of value added shares and employment shares in agriculture: In value added, the shares of the agricultural sectors are declining in the most recent period also in those economies in which there were previously signs of 'reagrarization' (Bulgaria and Romania); this trend supports the view that the phenomenon reflects mostly the dramatic overall jobs crisis in these countries.

Deindustrialization:

Broadly, one can speak of a general process of 'deindustrialization' with falling absolute employment levels in the industrial sectors (comprising manufacturing, mining, water and electricity supply, construction). In share terms, however, there are some interesting exceptions to the general decline of employment in the industrial sector. In Hungary the employment shares of the industrial sector have recovered after the initial drop at the beginning of the transition and value added shares have risen again in Hungary and the Czech Republic and stabilized in Slovenia. In relation to both the EU North and the EU South, some of the CEECs maintain, also at the end of the first decade of transition, a high share of manufacturing/industry in both value added and employment (for employment shares see Figure 1.3). There are differences in value added and employment shares: the Czech Republic and Slovenia, followed by the Slovak Republic and Hungary are the countries with the highest employment shares in industry, while the Czech Republic, Slovenia and Romania, followed by Poland are the countries with the highest shares in value added. These differences reflect, of course, differences in relative sectoral productivity levels, e.g. the extremely low productivity level in Romanian agriculture would push up industry's share in value added in spite of its own low level of productivity. The levelling off of relative employment losses in manufacturing in some of the CEECs (such as Hungary and Poland) and persistence of manufacturing's relatively high value added shares could be an indication of the attractiveness of some of the CEECs as locations for some of Europe's industries within the context of an overall European division of labour. We shall return to this issue in later sections of this paper.

Tertiarization:

As regards the 'tertiary sector', there are clear signs of a catching-up process of the CEECs in the relative size of this sector (although, just as in the West, the changes are partially due to statistical reclassifications and sourcing out of service activities previously undertaken within the other sectors). Again, the relative increase of the importance of the services sector in the CEECs over the last decade has not necessarily been in line with the size of the initial gap (relative to the Western European employment structure). Thus, countries such as Hungary, Slovenia, Slovakia and the Czech Republic experienced very substantial increases in the shares of the services sector, while countries such as Romania and Poland where the initial shares of the services sector in overall employment were relatively low, experienced rather modest share increases. In absolute terms, the employment gains in the services sector were far from sufficient to compensate for the employment losses in the other two sectors (see Table 1.2).

Figure 1.1

Comparison of CEECs' employment structures in 1989, 1993 and 1998

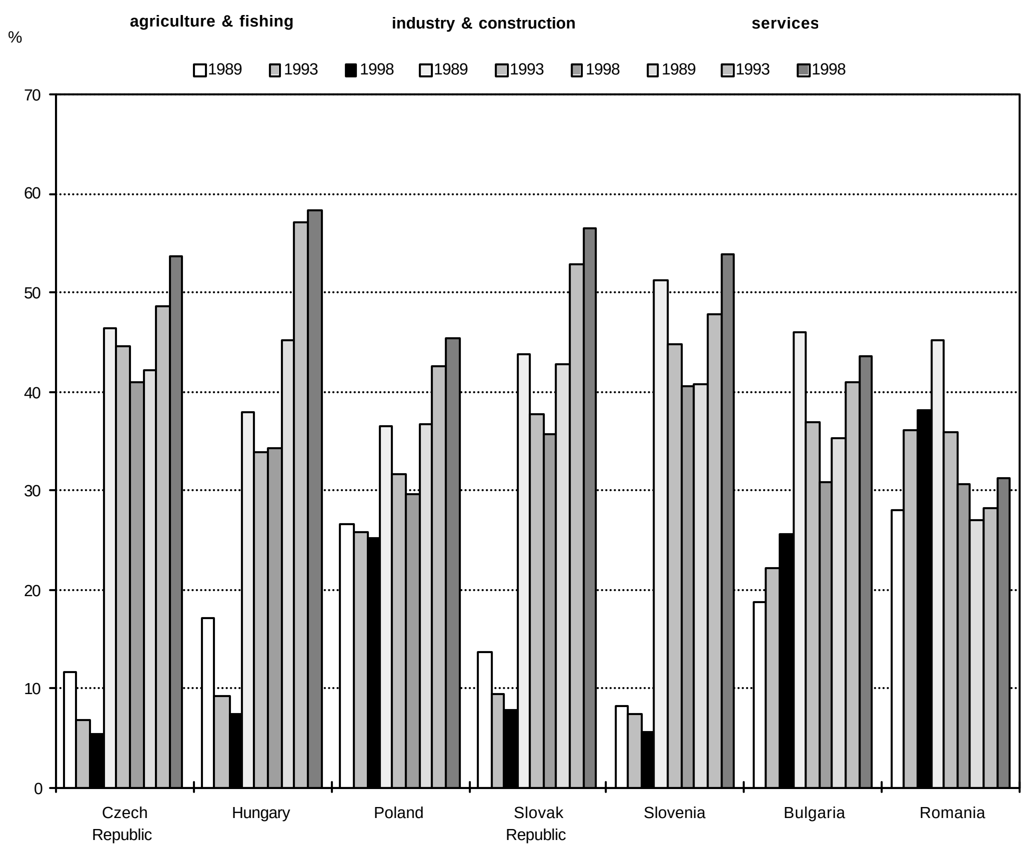


Figure 1.2

Comparison of CEECs value added structures in 1989,1993 and 1998

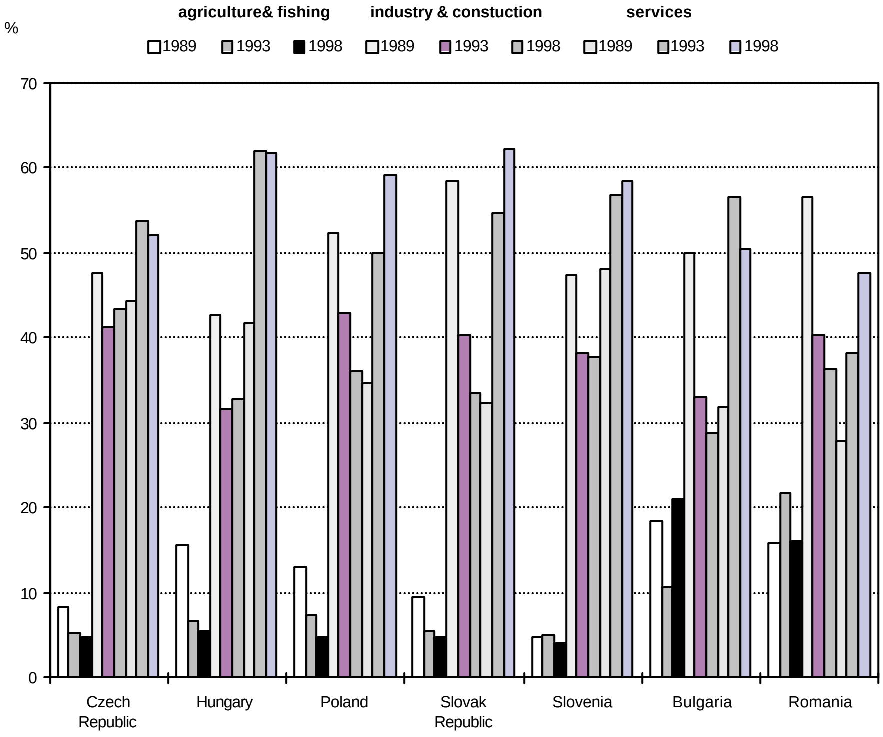
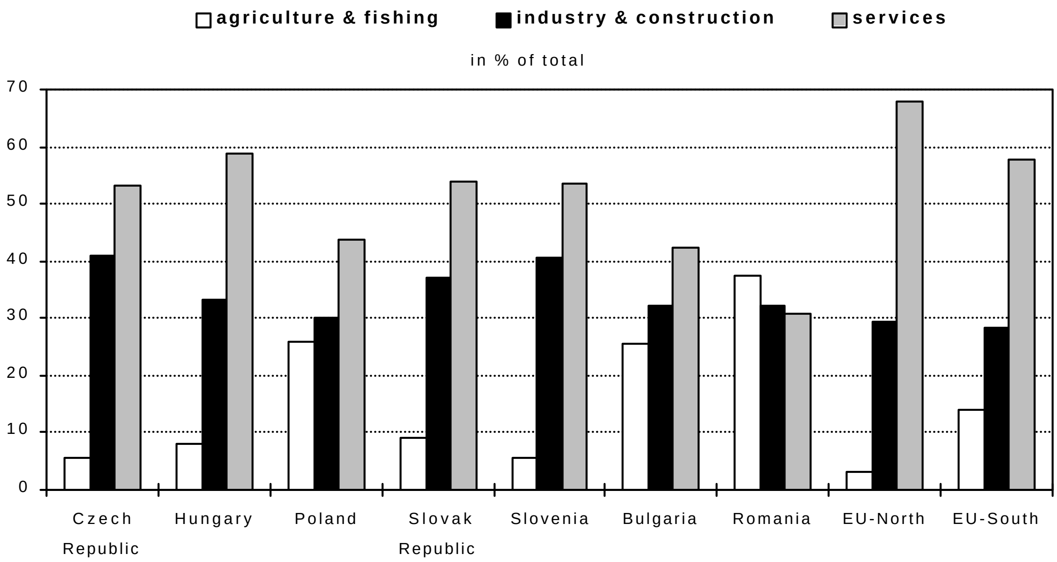


Figure 1.3

CEECs' employment structures compared with EU-North and EU- South in 1997



2 Employment and patterns of industrial restructuring

Overall employment drops since the beginning of the transition were very substantial in the CEECs (see Figure 2.1). As one can see, the employment reductions were concentrated in some countries (Hungary, Poland) in the early phases of the transition, 1990-93, while in other economies, such as Romania and the Slovak Republic, substantial overall employment declines took place also in periods after 1993. The GDP growth – employment growth relationship (see Table 2.1) reveals big changes between the periods 1990-92 and 1993-98 and also great diversity across countries: Hungary and Slovenia are examples of countries which combined relatively strong GDP performances with continued cumulative declines in employment levels (indicating strong restructuring) while this relationship is much less visible in, say, the Czech Republic.

Figure 2.1

Employment trends in CEECs
1989 = 100

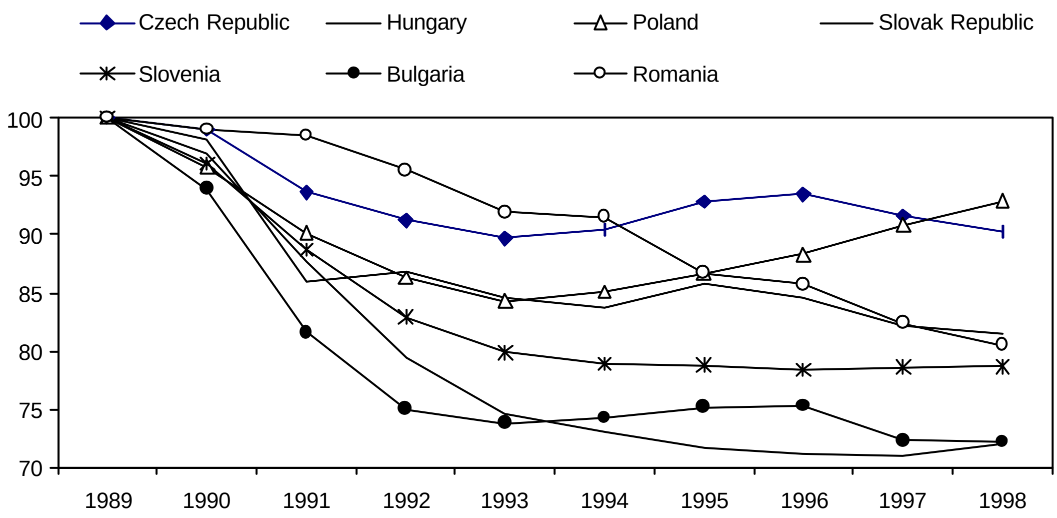


Table 2.1

GDP and employment 1990 -1998
cumulated growth in %

	GDP			Employment			Employment growth, 1000 persons		
	1990-92	1993-98	1990-98	1990-92	1993-98	1990-98	1989-92	1993-98	1990-98
Czech Republic	-13.2	10.2	-4.3	-8.8	-1.1	-9.8	-475.9	-53.7	-529.6
Hungary	-17.6	15.4	-4.9	-21.9	-9.4	-29.3	-1144.5	-385.0	-1529.5
Poland	-15.6	38.6	16.9	-13.7	7.7	-7.1	-2325.2	1123.8	-1201.4
Slovak Republic	-22.1	28.0	-0.3	-13.2	-6.2	-18.5	-329.5	-134.1	-463.6
Slovenia	-17.9	26.8	4.1	-17.1	-5.0	-21.3	-162.2	-38.9	-201.1
Bulgaria	-25.6	-10.8	-33.6	-25.0	-5.1	-28.8	-1091.4	-167.5	-1258.9
Romania	-25.0	3.5	-22.4	-4.5	-15.4	-19.2	-487.7	-1615.5	-2103.2

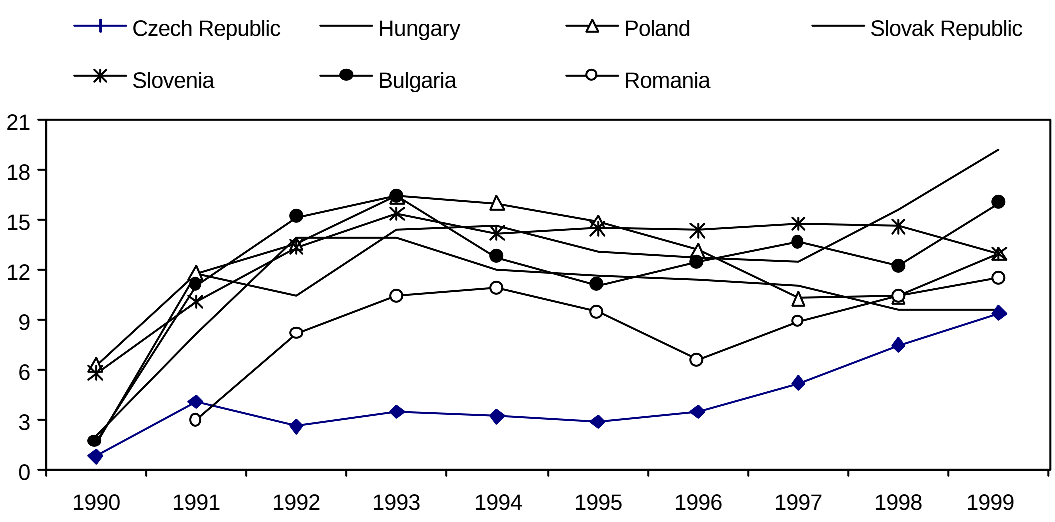
Source: WIIW Database incorporating national statistics.

The large cumulative employment drop in the CEE region is reflected in falling labour force participation rates in all CEECs since the beginning of the transition.[3] A comparison between the transition countries covered here and the EU-15 shows that, despite considerable falls in the initial period of transition, participation rates are higher than the EU average (68%) in the Czech Republic, Slovakia and Romania, similar to the EU-15 level in Poland, and lower than in the EU in Hungary and Bulgaria. Employment rates (total number of employed relative to the population aged 15-64) also showed a wide range, from close to 70% in Romania and the Czech Republic (in 1998) to 54% in Hungary. A comparison of employment rates in CEECs and the EU in 1998 shows that the average CEE-7 rate stood at 62.7%, slightly higher than the EU average of 61%. The gender gap in employment rates remained smaller in the CEECs compared to most countries in the EU.

Unemployment rates (see Figure 2.2) reveal moves to unemployment rates between 9% and 19% in the CEECs by the year 1999 which reflect the development patterns of employment levels on the one hand and of the labour force (particularly of participation rates) on the other. We can see that the Czech 'unemployment miracle' which lasted until 1996 has evaporated and that both the slight fall in the unemployment rate in the mid-1990s and its deterioration in the late 1990s reflected, first, higher GDP growth in the region and, more recently, a slow-down (after 1999 positive growth is recorded again). Unemployment rates across the region have reached a range not dissimilar to the EU in the 1990s and reflect now more strongly GDP growth patterns.

Figure 2.2

Unemployment rates based on registration data, in %



3 This section relies on information contained in Vidovic (2000).

We shall now concentrate on features of the process of restructuring which took place in the industrial (or manufacturing) sector and examine the development of output, employment and, hence, labour productivity over two phases: the phase immediately after the beginning of the transition (1990-93) and the phase after that (1993-1998).

Figure 2.3 depicts annual growth rates of production, employment, (labour) productivity, investment, and exports in the industrial sectors of the CEE-7. It shows clearly the features of the two distinct developmental phases since the beginning of the transformation: deep 'transformational recessions' followed by economic recoveries in the CEE-5 (with, however, growth interruptions which the annual time series indicate) while there was still a negative trend growth rate of production for the EE-2 (Bulgaria and Romania).

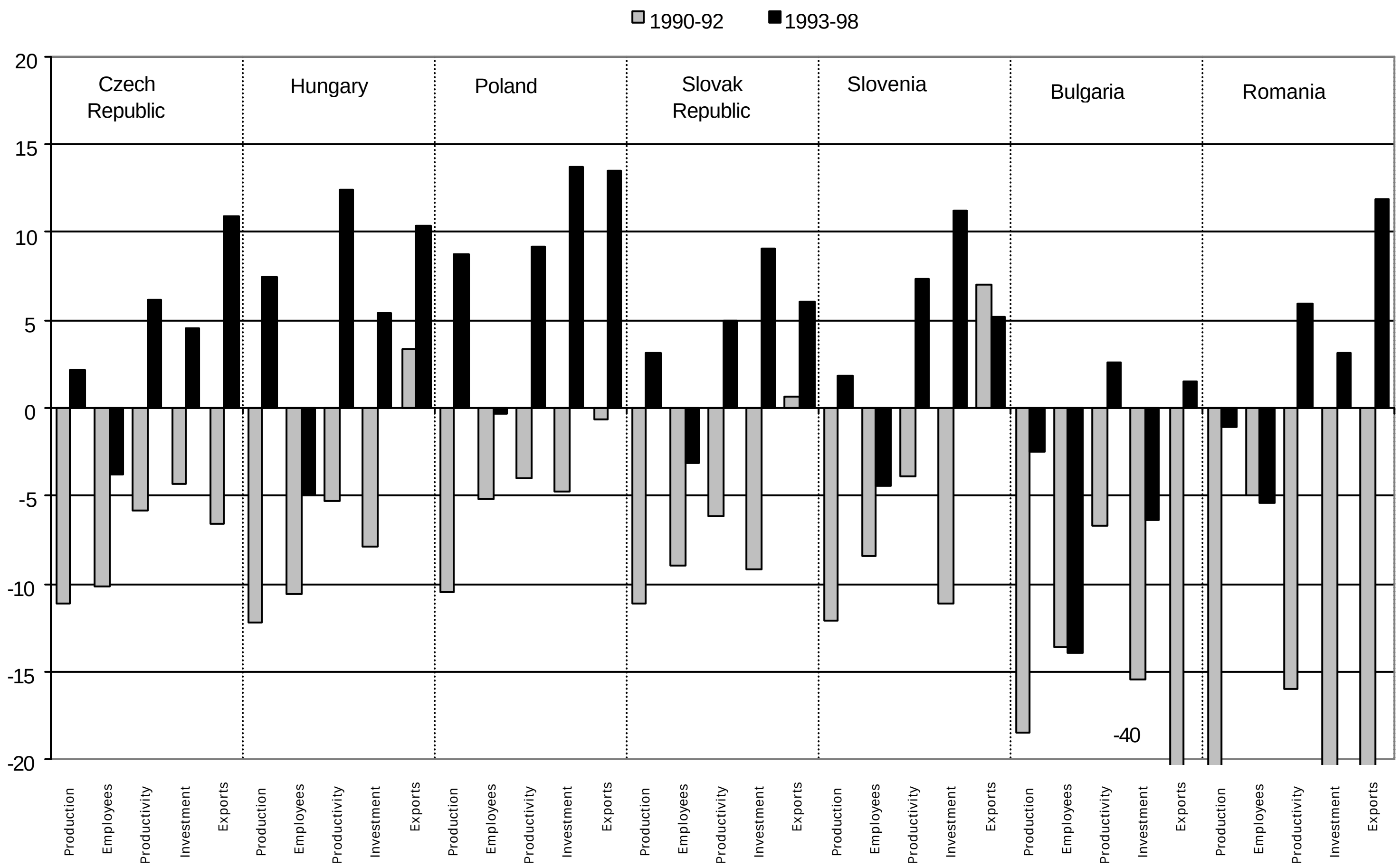
Over the more recent period 1993-98 patterns across the CEECs continued to differ: the strongest resumption of industrial production could be observed in Poland and Hungary, while (labour) productivity growth was highest in Hungary (where production growth went along with continued employment declines), followed by Poland (with high output growth and nearly stable employment levels); productivity growth was more moderate in the Czech Republic, Slovakia and Slovenia where more moderate trend growth rates of output went along with less labour shake-out from industry compared to Hungary. The EE-2 continued to be characterized by declining industrial production, and even sharper contraction of employment (particularly in Bulgaria) which led to moderate increases in productivity levels and a sharp slump in industrial investment; overall export performance remained disappointing in Bulgaria, while the Romanian experience was more successful on these accounts.

In the features of the growth profiles of the two periods we can detect some of the important peculiarities of the transition processes in CEECs:

- There is evidence for non-market conforming behaviour particularly in the first period, and for the 'laggards' also in the second period: e.g. substantial labour hoarding in the face of declining output, or investment declining less than output; however, the evidence for such behaviour (at this macro-level) is much less evident over the second period.
- The diversity of performance across the CEE economies remains very pronounced also over the second period, evidenced in the first place by the difference in performance between the CEE-5 and the EE-2 group; but also within the CEE-5 group we can perceive sharply differing trend growth rates in productivity, investment and export performance. The fast trend growth rates in productivity and high export growth rates in some of them (productivity growth being high in Hungary and Poland, export growth in Hungary, Poland and the Czech Republic) does provide some evidence of a move towards 'active restructuring', i.e. of a change in behavioural responses by enterprises moving actively into new markets, upgrading the composition and quality of their products (see sections 4 and 6 below) and restructuring their production processes.

Figure 2.3

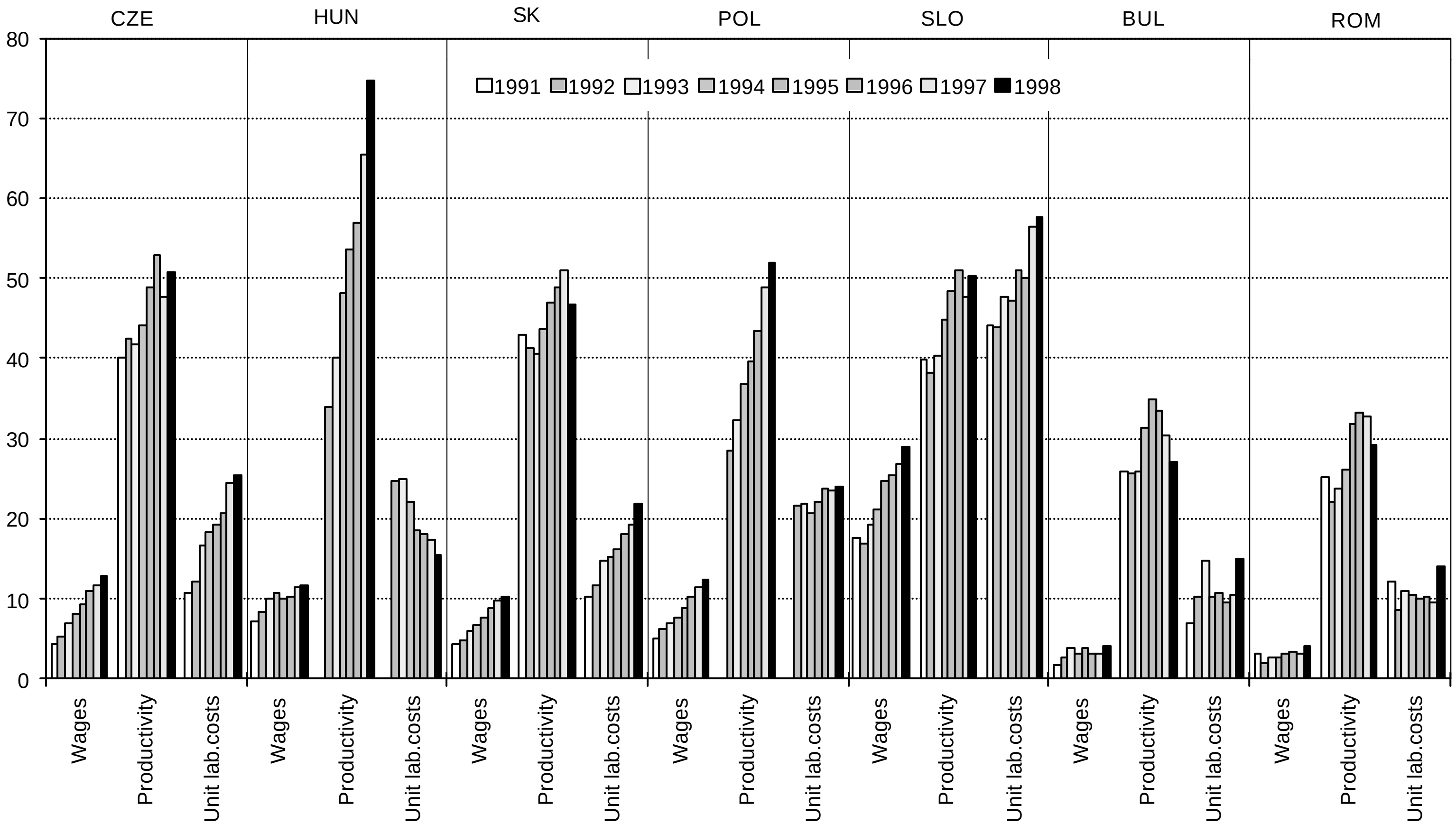
Industrial production, employees, productivity, investment and exports average annual growth rate in %, 1990-92 and 1993-98



Note: Growth rates for production, investment and productivity are calculated from constant price data; for exports from current USD price data.

Figure 2.4

Total manufacturing
Wages (ECU), Productivity (PPP) and Unit labour costs (ECU)
Austria 1996 = 100



Differences in productivity growth, leading to differentiated labour unit cost performances can also be observed from Figure 2.4 where wage rate growth (at current exchange rates) and productivity levels have been plotted in relation to the Austrian levels (Austrian levels have been kept constant to avoid taking in wage and exchange rate movements on the Austrian side as well) over the period 1991-98. We can see the superior Hungarian and Polish performances leading to improving or stationary relative labour unit costs in these two countries, while in the other CEE-5 (Czech and Slovak Republics, Slovenia) the relationship between wage growth and productivity growth was such that relative labour unit costs rose. Wage growth (at current exchange rates) in Bulgaria and Romania was very low so that moderate productivity growth led to relatively stable labour unit cost positions of these two economies.

We now move on to examine some evidence concerning an interesting differentiation of processes of restructuring across industrial branches:

In particular, we look at branch patterns of productivity, wage and unit labour cost growth. A cross-industry analysis shows that wage rate growth is less dispersed than productivity growth (see Havlik, Landesmann, 2000) so that cross-industry differences in (labour) productivity growth also show up in relative labour unit cost movements, i.e. the industries with above average productivity growth also improve their relative position in relative labour unit costs. We shall return to this issue when discussing the scope for the dynamics of CEE economies in the structures of comparative advantage within the overall European economy in section 6 of this paper.

For the moment we just want to point to some interesting patterns in the catching-up processes of a select group of industries. Figure 2.5 looks at 5 industries (at the NACE 2-digit level), namely textiles (DB), leather (DC), machinery (DK), electrical goods (DL), and transport equipment (DM). It shows the evolution of wage and productivity levels and of unit labour costs relative to Austria over the period 1991 to 1998. Productivity levels are expressed at constant prices for 1996 (with output levels compared at PPP rates); wage levels are compared at current exchange rates.[4]

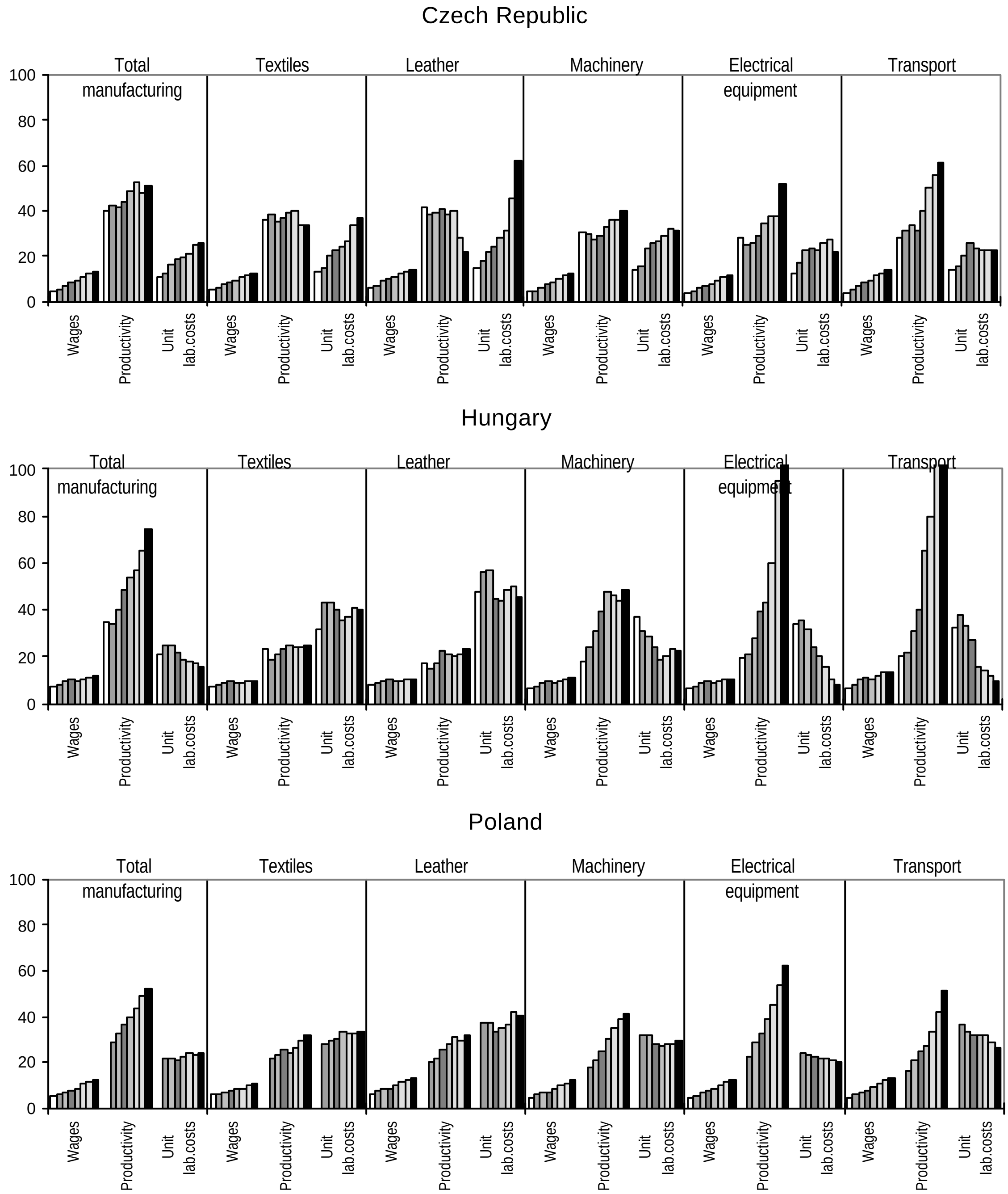
For total manufacturing (also included in Figure 2.5) wages and productivity levels are growing relative to Austria in the Czech Republic, the Slovak Republic, Poland and Slovenia. Wages are relatively stable in Hungary, Romania, and Bulgaria. On average the countries reach a wage level of 10 to 15% relative to Austria; exceptions are Slovenia with a level of almost 30% and, on the other end of the spectrum, Bulgaria and Romania with less than 5%.

4 For a more detailed discussion of the methodology used and further results based on industry-level PPP rates, see Havlik/Landesmann (2000).

Figure 2.5

Dynamics of wages, productivity and unit labour costs in CEECs, 1991-98

relative to Austria (1996 = 100)



(Figure 2.5 ctd.)

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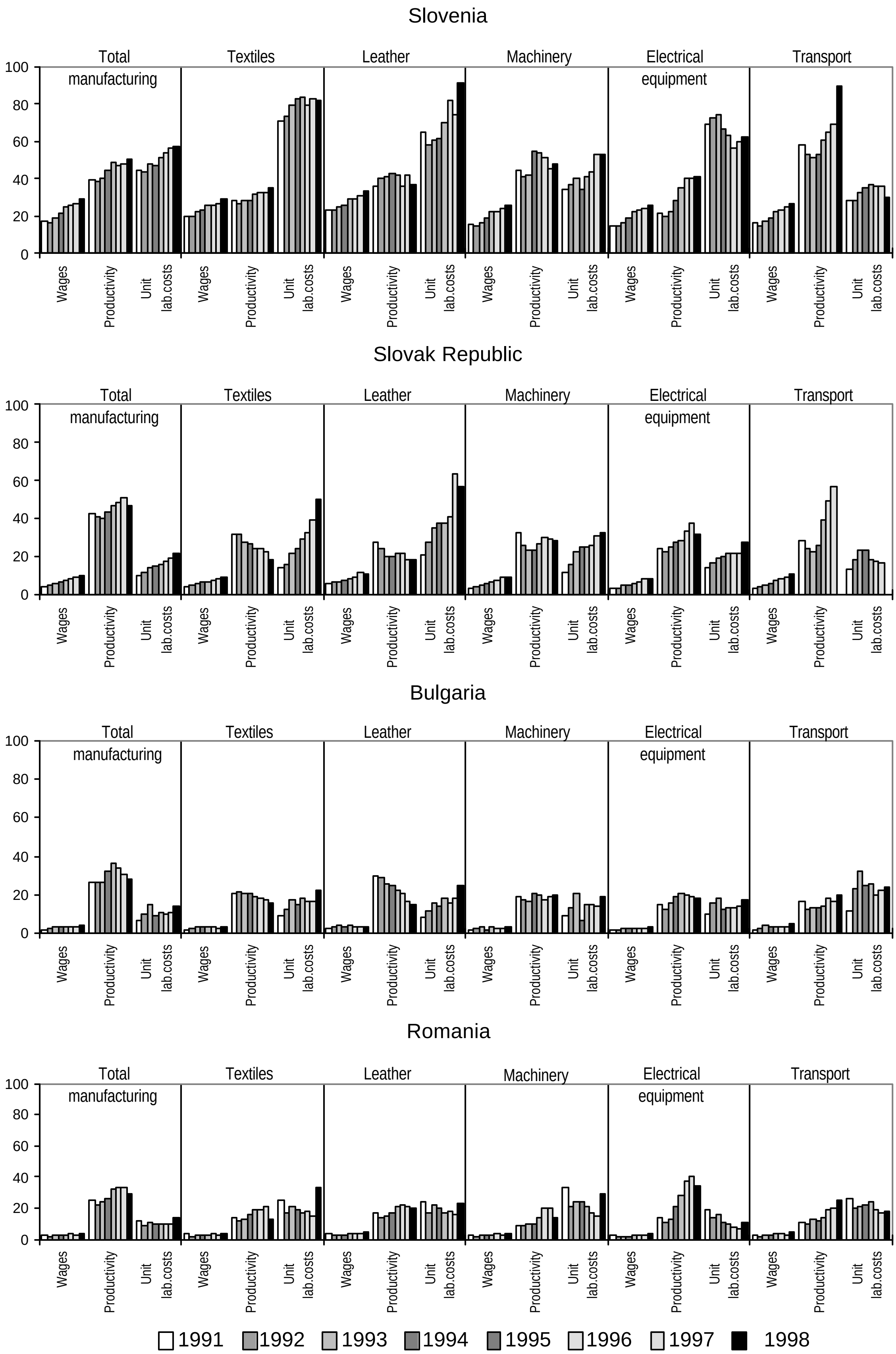


Productivity levels have grown in all countries since 1991 and are at a higher level than wages (all relative to Austria). The Czech Republic, the Slovak Republic, Poland, and Slovenia have in 1998 a productivity level in total manufacturing of about 50% of the Austrian level. The highest relative level is reached by Hungary with about 70%. The performance of Bulgaria and Romania is worse at a level of 30 to 35%.

The evolution of unit labour costs (ULC) results from the growth of wage levels versus the growth of productivity levels. ULC have grown most rapidly in the Czech Republic from a level of about 10% in 1991 to about 25% in 1998 and in the Slovak Republic again from 10% to about 20%, which implies that wages were growing faster than productivity. In the other countries the ULC are rather constant (Poland and Romania) or even falling (e.g. in Hungary). In Slovenia the ULC are the highest relative to the other CEECs at a level of about 50%.

But there are quite large differences if one looks at individual branches. Without going into detail and describing the different trajectories for each country and industry we only want to emphasize some general patterns. In most CEECs the productivity levels of the five industries (relative to Austria) have initially been rather higher in the 'low-tech' sectors (textiles, clothing, footwear and leather products). An exception is Slovenia with rather high levels in the machinery and the transport sector. Looking now at the evolution over time, *the general pattern is that catching-up is stronger and in some cases much stronger in the 'medium/high-tech' (machinery, electrical equipment, transport) than in the 'low-tech' sectors*. In the low-tech branches, relative productivity growth is for some countries constant (e.g. Czech Republic and Hungary) or even negative (e.g. in the Slovak Republic). Wage catching-up, on the other hand, is very similar across branches, which means that there is a wage drift between industries and that these countries are gaining comparative (unit cost) advantages in the medium-/high-tech industries. This can also be seen by looking at the ULCs, which in most countries are rising much faster in the low-tech than in the medium-/high-tech industries. We shall return to a discussion of this issue in section 6 of the paper.

Next we divide the 14 industries into three subgroups[5]: a *low-tech group* (including DA (food products, beverages, and tobacco; letters refer to NACE codes), DB (textiles and textile products), and DC (leather and leather products)); a *medium/high-tech group* (including DK (machinery and equipment), DL (electrical and optical equipment) and DM (transport equipment)), and a *resource- (and scale-) intensive group* (including DD (wood and wood products), DF (coke, refined petroleum products and nuclear fuel), DG (chemicals, chemical products and man-made fibres), and DI (other non-metallic mineral products)). We refer to Table 2.2 for initial gaps and growth rates (more precisely:

5 The following calculations are taken from Stehrer et al. (1999).

per annum rates of decline in the gap) in the productivity levels and wage rates of the three industrial groupings across the whole country sample over the period 1991-97.

As regards productivity catching-up, the high-tech industries experienced the highest average growth rate (16% p.a.) and, compared to the resource-intensive industries, show a rather high initial gap. The low-tech industries have an initial gap comparable to the high-tech industries, but a very low growth rate in the closure of the gap across branches within this group (4% p.a.). The resource-intensive industries show the lowest initial gap on average and a relatively high growth rate in the closure of the gap (7% p.a.).

Table 2.2

Average initial gap and growth rate for industry groups

	low-tech		resource-intensive		high-tech	
	Productivity	**Wages**	**Productivity**	**wages**	**productivity**	**wages**
Gap (in %)	38.2	33.7	44.6	29.2	34.3	27.4
Growth rate (in %)	3.5	4.9	7.0	7.8	16.1	7.9

Note: Gap is defined as: level of a variable (productivity, wage rate) in CEECs in 1991 x 100 divided by the level of that variable in Austria in 1991. Growth rate refers to the per annum rate of decline (in %) of the Gap over the period 1991-97.

Table 2.2 also allows us to make some comparisons between productivity and wage catching-up across the three industrial groupings. (Note, however, that wages are in this calculation expressed at current PPP's and productivity at constant prices; thus the absolute values for the growth rates are not comparable, but the relative structure across branches is interesting):

The initial gap in labour productivity levels is highest in the medium-/high-tech industries and lowest in the resource-intensive industries, with the low-tech sectors lying in between. The initial gap of wages is higher than that of productivity levels in all three groups and much more similar across industries. This pattern is quite different if one looks at the growth rates of these two variables. Productivity growth is highest on average in the medium-/high-tech sectors, medium in the resource-intensive industries and lowest in the low-tech sectors. But the growth rates in wages are much more similar across these industry groups, almost the same in the medium-/high-tech and resource-intensive industries, and a little bit lower in the low-tech industries. In the low-tech and resource-intensive industries the wage growth rate is higher than the productivity growth rate; in the medium-/high-tech industry the productivity growth rate is much higher than wage growth. Thus, whereas the comparative cost advantage in 1991 was in the resource based industries for the CEECs, this pattern may have changed. The CEECs are gaining comparative cost advantages in the 'medium-/higher-tech' sectors and losing comparative cost advantages in the 'low-tech' industries.

Let us draw some conclusions from our analysis of catching-up patterns at the disaggregated level:

The overall pattern is that the CEE-5 are catching up in productivity levels relatively faster in the technologically more sophisticated industries than in the low-tech industries. We shall report in section 6 some econometric results obtained for a wider range of catching-up economies which also shows this pattern. How do we explain such a pattern? Without going into a full discussion at this stage, we know that there is the general hypothesis from the 'convergence' growth literature that countries lagging further behind at a starting point of such a convergence process are catching up faster. Applying this idea at the level of industries, this would indicate that the rate of closure of a productivity gap can be higher in those industries in which the initial gaps (and hence the 'learning potential') would be higher. Other factors which could further substantiate the analysis are the impact of FDI patterns, industry-specific skill endowments and different learning curves across the industrial branches. A second important result is that the catching-up of wages is much more similar across branches within the countries. Although the statistical database for the CEECs is rather small, this pattern emerges quite clearly (see also the more general results reported in section 6). *The overall result of this general pattern is that, due to the uneven industrial pattern of catching up in productivity levels across industries and, on the other hand, the wage drift across industrial branches, catching-up countries have the potential to increasingly gain comparative advantages in the technologically more sophisticated industries.*

3 FDI involvement by branch

FDI involvement in the transition economies has attracted a lot of attention both in research as well as in policy discussion. The topic is also a very important one for the subject matter of this paper, as most research has shown that FDI acts as a very important agent of change in transition economies. In fact, most of the company level analysis available (see e.g. Carlin et al., 1997, 1999) indicates that it provides the indispensable change of governance structure needed for 'active restructuring'. The research material available in this area is vast and I shall restrict myself to a few select points:

– Those CEECs which were able to attract substantial FDI have positioned themselves amongst those economies internationally with the strongest FDI presence in their economies.

– It can be shown that firms with foreign ownership involvement (FIEs) are more capital-intensive and invest more, show higher productivity levels and are more export-oriented than the domestically owned enterprises (DCs).

– While there are a wide range of motives for foreign capital to get involved in different branches (domestic market orientation, export base, strategic actions to obtain early entry advantages vis-à-vis competitors, etc.) there is no sign that FDI in CEECs is mostly oriented towards labour-intensive, low-skill, or domestic market-oriented manufacturing branches.

We shall now proceed to present some supportive material for the above points.

Figures 3.1 and 3.2 show both in flow as well as in stock terms the relevance of FDI in CEECs. Figure 3.1. shows the contribution of FDI investment (which includes takeover investment) in gross fixed capital formation (GFCF), while Figure 3.2. gives the value of the FDI stock in relation to GDP. Both the figures also present such values for a range of non-CEE economies some of which have over the 1990s been amongst the largest FDI receivers globally (in relation to the size of their economies). We can see that from about the mid-1990s, some of the CEECs have been amongst the largest receivers of FDI in relation to GFCF. Also looking at the stock measure (FDI stock/GDP) we can see that some of the CEECs have been among the lead nations internationally to receive FDI; this is remarkable since this stock had to be accumulated over a much shorter period of time in the CEECs (which, before the transition started in 1990, were hardly open to FDI at all) than was the case for the comparative group of economies.

Figure 3.1

FDI inflow as a percentage of gross fixed capital formation

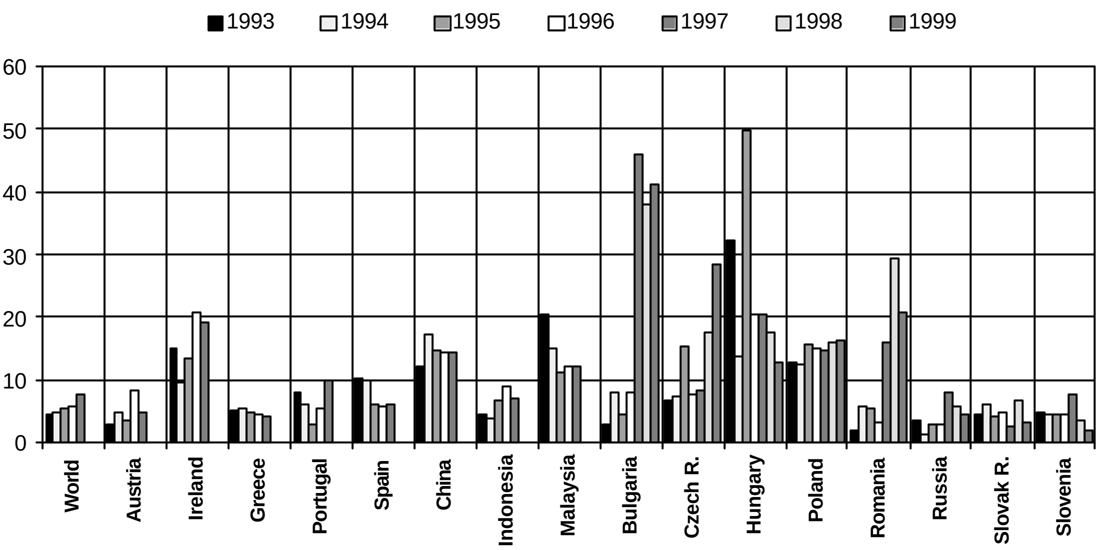
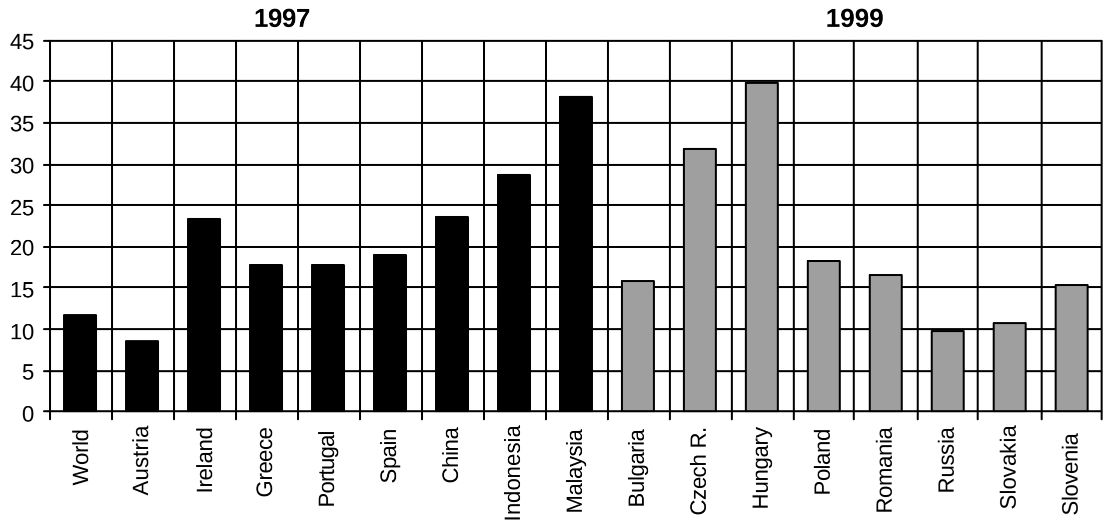


Figure 3.2

FDI stock as a percentage of gross domestic product



However, we also clearly see the unevenness of the FDI presence across CEECs, a fact which is well known and does not need to be discussed here further. The time pattern of FDI flows also reveals, among other things, the sequencing of the privatization processes and when participation in the privatization processes were opened up to foreigners. This, of course, also affects the distribution of FDI across sectors and branches (see below).

Next, we report some performance measures of FIEs in relation to general performance[6]. Table 3.1 presents the shares of FIEs in the manufacturing sectors of the CEE-5 in relation to a number of variables (equity capital, employment, investment, sales or output, exports). We can clearly see that FIEs are more strongly represented in sales or output than in employment; hence the levels of (labour) productivity are higher than the manufacturing average. They are more strongly represented in investments than in either sales or employment; hence their investment/sales and investment/employee ratios – i.e. their investment intensities – are higher than the national average and so are the capital intensities as measured by assets per employee. Finally, their export shares are higher than their sales/output shares; hence they are more export-intensive than the national manufacturing firms in total.

6 We rely here on research by Gábor Hunya who compiled within an ACE research network a database on FIEs from company level balance sheets (see e.g. Hunya, 1999). FIEs are defined as companies with some degree of foreign ownership involvement. This broad definition is less restrictive than it seems at first sight, as foreign ownership means in most cases a decisive influence on the governance structure.

Table 3.1

Share of foreign investment enterprises (FIEs) by main indicators of manufacturing companies, 1996, 1997, per cent

	Equity capital	Employ-ment	Invest-ments	Sales/ output	Export sales
Czech Republic[1]	21.5[2]	13.1	33.5	22.6	.
Czech R. 1997[3]	.	16.0	31.2	26.3	42.0
Hungary	67.4[4]	36.1	82.5	61.4	77.5
Hungary 1997	71.8[4]	42.8	79.8[5]	66.7	75.4
Poland[6]	30.4	15	43.1	30.3	33.8
Slovakia[3]	19.4	13.0	24.7	21.6	.
Slovenia	15.6	10.1	20.3	19.6	25.8

Notes: 1) Companies with 100 and more employees. – 2) Own capital. – 3) companies with 25 and more employees. – 4) Nominal capital in cash. – 5) Compared to the whole industry; corresponding figure for 1996: 68.6%; – 6) Corporate sector

Source: Hunya (1998b); Poland: Durka et al. (1998); 1997 data for the Czech Republic: Zemplinerová (1998); Hungary 1997:CSO (1999), Foreign Direct investment in Hungary, 1996-1997.

Table 3.2

Most significant FIE industries by output/sales

1996, per cent

(1) FIEs' share in total output/sales of the industry (penetration)

(2) Share of industry in total manufacturing FIE output/sale (specialization)

Czech Republic	(1)	(2)	Hungary	(1)	(2)
DM Transport equipment	55.0	28.0	DF Coke, Petroleum	99.2	15.6
DI Non-metallic minerals	45.6	11.0	DK Transport equipment	84.1	10.2
DH Rubber, plastic	43.8	5.9	DA Food, beverages, tobacco	51.1	20.9
DL Electrical, optical equipment	30.7	8.7	DL Electrical, optical equipment	65.1	12.7
DN Manufacturing n.e.c.	28.2	4.2	DG Chemicals	78.7	11.8
DA Food, beverages, tobacco	24.7	18.8	DE Paper, publishing	71.6	7.2
D Total manufacturing/Together	22.6	76.6	D Total manufacturing	61.4	78.4

Slovenia	(1)	(2)	Slovak Republic	(1)	(2)
DM Transport equipment	82.3	40.3	DM Transport equipment	61.4	26.3
DK Machinery, equipment n.e.c.	21.3	9.7	DL Electrical, optical equipment	37.0	9.5
DL Electrical, optical equipment	20.1	9.5	DE Paper, printing, publ.	25.6	7.9
DE Pulp, paper, printing	19.8	8.5	DB Textile and textile products	18.9	3.3
DG Chemicals	17.4	9.0	DK Machinery, equipment n.e.c.	17.2	6.8
DH Rubber, plastic	15.9	3.8	DA Food, beverages, tobacco	16.5	12.2
D Total manufacturing	21.1	80.8	D Total manufacturing	21.6	66.0

Source: Hunya (1998b).

As to the last point to be discussed in this section: Table 3.2 shows the distribution of FIEs across manufacturing branches and picks out those branches in four of the CEECs in which they are most heavily involved. The table does not include Poland or the EE-2. For the given economies, it shows that FIE involvement is strong in a number of capital-intensive, skill-intensive and export-intensive industries (particularly, transport equipment and electrical and optical equipment) although domestic market-oriented industries are also represented (such as food, beverages, tobacco) and some natural resource-intensive ones (pulp and paper in Slovenia, non-metallic minerals in the Czech Republic). The distribution of FIEs across those branches with substantial trade flows gives one indication of 'revealed comparative advantage' of CEE economies which is complementary to the analysis of trade flows (analysed in section 5 below). It requires further research which is not further elaborated in this paper.

Another area of important further research should build on the comparisons referred to above between FIEs and DCs. It would go deeper into the analysis of the development of 'dual structures' in the CEECs between the FIE and the DC sectors and whether performance indicators converge or diverge between them over time. Little detailed research is available so far on this question as well as on 'spillovers' between FIEs and DCs in a wider sense (i.e. not only in the same sectors but also across sectors) and on the nature of these spillovers (sub-contracting and supplier networks, human capital and knowledge transfers, etc.)

4 Trade specialization

4a Patterns of trade specialization with the EU: inter-industry specialization

Factor intensities

RCAs and RCA changes

In the following I shall refer to research concerning the pattern of trade specialization of CEECs (see past WIIW research in this area using a similar methodology: Landesmann, 1996, Havlik, 1999).

Figures 4.1a-e (see Appendix) present a series of graphs which show how the CEE-7 exports are represented in the EU-12 import structure[7] (Figs. 4.1). In the case of the CEE export structure, the graphs have been normalized such that the structure of average EU imports have been set to zero and the CEE export structure is presented as the difference between the EU import norm and the respective CEECs exports in the different categories. The categories depicted are each time a grouping of industries according to factor intensities, i.e. the 10, 20, 30, most x-factor-intensive industries (where x stands

7 The EU-12 rather than the EU-15 grouping is used to provide a consistent time series going back to 1989.

respectively for labour, capital, R&D, skill, and energy) out of the full sample of 3-digit NACE industries for which such factor intensity measures exist (see Table 4.1 in the Appendix).[8]

Let us summarize the results from the factor intensity analysis of CEEC trade flows in relation to other importers to the EU (including EU countries trading in EU markets):

– The CEECs started in their trading structure with the EU with a profile typical for a less developed economy trading with more developed economies: their representation in the labour-intensive industrial branches was above average, in the capital-, R&D- and skill-intensive branches below average (particularly in the latter two), while their representation in energy-intensive branches was, except for Hungary, above-average which reflects the heritage of cheap energy supplies within the CMEA in the CEECs industrial export structure.

– Over time, important changes took place in the CEECs export structure vis-à-vis overall EU imports and in their RCAs in these different categories of industries: the most remarkable change took place in Hungary: from sizeable deficits in its exports (relative to total EU imports) in the areas of capital-, R&D- and skill-intensive industries, it either completely eroded these deficits to zero or even achieved surpluses relative to the overall EU import structure. This pattern is followed in a much less spectacular manner in Poland and the Czech Republic where deficits in the representation of skill-, R&D- and capital-intensive branches have been reduced. For these economies and also for the Slovak Republic the relatively strong presence of energy-intensive branches has been substantially reduced while this has not at all been the case with Romanian and Bulgarian exports to the EU (particularly in the latter case, dependence upon energy-intensive exports to the EU has increased markedly). Also the picture with respect to labour-intensive industries is remarkably different in the cases of Romania and Bulgaria, on the one hand, and the CEE-5 on the other. The dependence upon labour intensive export products has increased markedly in the case of the EE-2 while it has declined strongly in the case of the CEE-5 who show no longer any positive specialization in this direction.

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[8] The factor intensities of the different 3-digit NACE industries are given in Appendix table 4.3. and have been compiled from EU sources; they have been previously used in Landesmann (1996) and Havlik (1999) where also the caveats with respect to these measures are discussed. The factor intensity definitions are the following ones:

capital intensity has been measured as cumulative (5 year) investment flows per employee

labour intensity as employees/output

R&D intensity as cumulative R&D flows (5years) per employee

skill intensity as non-production workers/total labour force

energy-intensity as energy inputs in total inputs

Some of these indicators (such as R&D) were not always available at the 3-digit level; in this case the 2-digit information has been applied to all the 3-digit NACE industries belonging to the 2-digit industry.

- Lastly, we turn to the CEECs' position in their trade structure with the EU in relation to specific other lower income economies, particularly the Southern EU economies, but also Turkey and Ireland (which underwent a remarkable catching-up process). The comparisons can be seen in Figs. 4.2.a-e for revealed comparative advantage indicators (RCAs)[9]. We can see the following:
- With the exception of the EE-2 the CEECs show (by 1998) a much lower representation of labour intensive industries in the export structure to the EU than do Greece, Portugal and Turkey; their export structure is more in line with that of Spain in this respect.
- The same could be said with respect to the representation of R&D- and skill- intensive branches in their exports to the EU: Most CEECs – again with the exception of the EE-2 – have reduced their sizeable deficits here relative to the EU overall import structure, which brings them more in line with the more advanced of the Southern EU economies rather than with the less advanced ones.
- Particularly remarkable are the developments of Hungary's trading structure with the EU. Given the degree of inter-industry branch specialization of this data set we observe features of Hungary's export structure and RCA performance which are close to Ireland's performance. This is an economy whose trading structure has similarly been shaped by the very strong involvement of FDI in its industrial development.

4b Patterns of trade specialization with the EU: vertical product differentiation and product quality catching-up

The pattern of inter-industry trade specialization or erosion of such specialization should not distract from another dimension in which substantial differentiation across producers can be observed in international trade. I refer here to '*vertical product differentiation*' in international trade, an area in which substantial recent research has been undertaken (see Burgstaller and Landesmann, 1999, Jansen and Landesmann, 1999, Fontagné and Freudenberg, 1997, Aiginger, 2000, etc.). Vertical product differentiation refers to a situation in which producers are differentiated by the 'quality' of the product variant which they sell as compared to 'horizontal product differentiation' in which different consumers might prefer one variant over another, but in which no agreed quality ranking across products exists.

The measure used in our own analysis of 'quality differentiation' is the unit price charged for a very narrowly defined product (at the 8-digit CN product level of international trade statistics) in the same – i.e. EU – market. At the 3-digit level the following 'price/quality gap' measure has been compiled:

[9] RCAs of an industry are defined are defined as: $(X_i – M_i)/(X_i + M_i)$ where X_i and M_i refer to exports and imports of industry i (to/from the EU) respectively. We refer in the following also to export structure comparisons for which we omit the corresponding figures for lack of space; they are available upon request.

For each industry the full (8-digit CN) product level information was used to construct an industry-level (weighted) price gap indicator for country c's exports to the EU, which was arrived at as:

$$Q^c_j = \sum_{i \in I(j)} (p^c_i / p^{EU}_i) . \chi^c_i$$

where

p^c_i is the price (per kg) at which country c sells exports of the product item i on EU markets (which refers here to the EU 12 market),

p^{EU}_i is the average price of product item i in total EU 12 imports and

χ^c_i is the share of product item i in country c's exports to the EU 12 market, i.e.

$$\chi^c_i = x^c_i / \sum_{i \in I(j)} x^c_i$$

with $\sum_{i \in I(j)} \chi^c_i = 1$

where x^c_i is the export value of product i for country c and

$I(j)$ is the set of product items i belonging to (3-digit NACE) industry j.

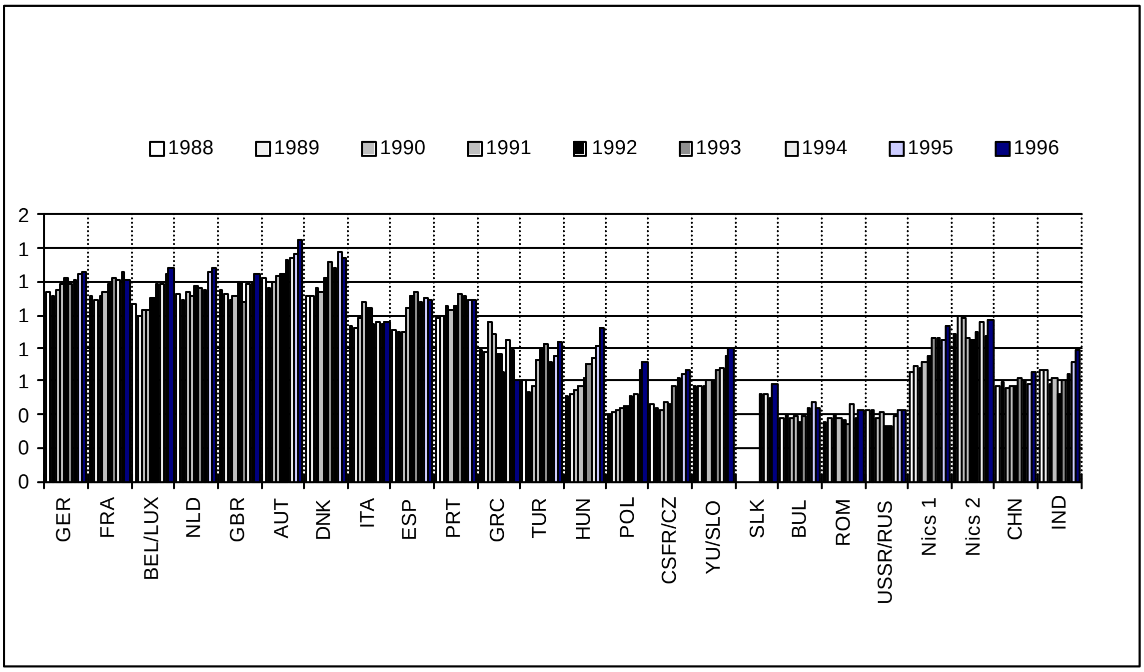
In the following, we shall present some selective evidence for the positions of CEECs in the vertically differentiated structure of EU trade (for a fuller set of results see Burgstaller and Landesmann, 1999).

In Figure 4.3 we can see the export price ('product quality') hierarchies as they reveal themselves for a select group of engineering industries (all engineering products except for transport equipment) over the period 1988 to 1996. The graph reveals a clear picture of a hierarchy in which the 'Northern EU' countries occupy the top positions in the export unit values which their engineering products fetch on EU markets, followed by the Southern EU countries, with two groups of Asian NICs (the 'four tigers' as NICs1 and a second group composed of Thailand, Malaysia, Philippines, Indonesia as NICs2) selling at similar price levels as Greece, followed by China and India. The starting point in 1988-91 for CEECs was characterized by extremely low (current ECU) export prices which their engineering products could fetch on EU markets, but after that we can see clearly rapid upward movements for the group of the CEE-5 in narrowing the 'price/quality gap' of their export products. There is no evidence of a narrowing of this gap for EE-2, Slovakia and Russia. They remain the 'lowest price/quality' suppliers on EU markets. Amongst the CEE-5, the Hungarian performance is again particularly impressive.

Figure 4.3

Price gap measures for engineering industries

(EU 12 = 1), Exports to EU



We shall present some econometric evidence for the speed of 'price/quality' convergence of CEECs' export products for a number of different sectors in section 6.

5 Convergence in structures?

Comparisons with EU South and EU North
Production structures and patterns of trade specialization
'Dual structures'

Another theme which occupied researchers at the Vienna Institute for International Economic Studies (WIIW) for quite a while is the question whether there is a 'convergence in structures' or whether there are specialization processes in production and employment structures between the CEECs and the EU economies. In this research we looked at indicators which provide a summary information on the similarity (or distance) between the industrial structures of different countries or country groupings. Table 5.1 gives some information concerning the calculated indicators for structural similarity of output shares in manufacturing industries (the underlying database used for calculating these summary indicators are two digit NACE industrial statistics). We distinguished to groups of reference countries with whom CEEC countries have been compared: A group of EU northern countries (composed of Belgium, France, Germany, UK) and a group of EU southern countries (composed of Greece, Portugal, Spain).

Broadly we can see the following:

- There is a clear difference across CEECs in their respective similarities or dissimilarities to the EU northern and EU southern group. The countries closest in the structure of manufacturing industry to the EU northern group are Slovenia and the Czech Republic followed by the Slovak Republic. The countries closest to the southern EU reference group are Poland, Bulgaria and Romania. The distance to the southern EU reference group is quite large for the other CEECs.
- As regards developments over time we can see that there was a general convergence in structures between the CEE-5 and the northern EU reference group over the period 1992 to 1998 (with the exception of Hungary over the last two years which results mostly from the sharp declines in the share of food products and the sharp increase in the share of electrical and optical equipment). Bulgaria and Romania seem to occupy a stationary position in their distance with respect to the EU northern reference group.

Detailed information with respect to structural comparisons for the two years 1993 and 1998 between the CEECs and the two EU reference groups can be obtained from Table 8.2. (in the case of output shares these have been calculated in this table for the CEECs at current prices with the EU structures shown for 1996). We can see substantial structural differences between the EU northern and EU southern industrial structures in manufacturing: the stronger representation of food products, as well as of the more labour-intensive branches of textiles and leather products and the raw material based wood products and non-metallic mineral products in the EU southern countries, while chemicals and all the engineering products as well as transport equipment with its supplier industries (rubber and plastics) are more strongly represented in the northern EU industrial structures. In the CEECs, we can see a strong representation of some of the CEECs in food products (Bulgaria, Poland, Romania, while there was a strong decline of the importance of that industry in Hungary), of wood and wood products in some of the economies with a lot of forests (Poland, Slovakia, Slovenia) and paper and paper products as a wood derivative. There is also a strong inherited position of basic metals and of machinery in some of the CEECs. Striking are the new, strong specializations of some CEECs in transport equipment (Hungary, Czech and Slovak Republics) and the remarkable strength of Hungary in electrical equipment (including electronics). The diversity and also dynamic in evolving specializations of some of the CEECs is apparent and also the ‘in-between’ position between the EU northern and EU southern economies as regards patterns of industrial specialization (in labour-intensive and resource-based industries, on the one hand, and capital-, technology- and skill-intensive-industries, on the other).

Table 5.1

Comparison of individual CEECs' industrial (output) structures with various groups of West European countries[1)]

	1989	1990	1991	1992	1992	1993	1994	1995	1996	1997	1998
						Structural deviation indicator (S)[2)]					
EU-advanced (Belgium, France, Germany, United Kingdom)[3)]											
Hungary	3.08	3.79	4.98	5.79[4)]	5.92	5.00	4.59	3.93	3.89	5.04	7.31
Poland	4.63 [4)]	4.83	5.89	.	5.67	5.51	5.34	5.01	4.87	4.49	4.40
Czech Rep.[5)]	4.65	4.71	4.34	.	3.45	3.49	3.51	3.57	3.21	3.10	2.79
Slovak Rep.[5)]	3.55	3.46	4.08	.	4.10	4.00	4.20	3.90	3.08	3.21	3.34
Slovenia	2.18	2.03	1.85	.	2.17	2.07	1.87	1.71	1.53	1.65	1.52
Bulgaria	4.06	5.10	5.56	.	6.15	4.97	4.46	4.49	4.98	4.55	4.62
Romania[6)]	4.32	4.50	4.98		5.57	4.27	*4.01*	*3.40*	*3.67*	*4.40*	*n.a.*
EU-South (Greece, Portugal, Spain)[3)]											
Hungary	3.49	3.21	3.36	3,84[4)]	3.86	3.16	3.10	3.02	3.58	6.18	8.35
Poland	3.12 [4)]	2.48	3.19	.	2.78	2.64	2.55	2.55	2.57	2.46	2.54
Czech Rep[.5)]	6.65	6.59	4.42	.	4.20	4.09	4.17	4.66	4.67	4.98	5.22
Slovak Rep.[5)]	4.81	4.38	4.10	.	4.36	4.96	5.70	6.35	5.92	6.29	6.73
Slovenia	5.88	5.27	4.81	.	4.93	4.73	5.10	5.25	4.90	4.90	5.14
Bulgaria	2.96	2.76	3.15	.	3.47	2.67	3.14	3.75	4.44	4.28	3.36
Romania[6)]	2.84	2.63	2.36	.	2.81	2.37	*3.64*	*3.54*	*3.04*	*3.60*	*n.a.*

Structural deviation indicator (S) between selected West European countries

	1992		1992
Germany/France	2.77	EU-North / EU-South	4.60
Germany/UK	2.75	Portugal / Germany	6.95
UK/France	2.48	Spain / Germany	5.25

Notes:

1) Based on 2-digit level NACE rev.1 data for output (at constant prices)

2) See following formula:

$$S = \sqrt{\sum_k (sh_k^x - sh_k^y)^2 \cdot (sh_k^y / 100)}$$

x = individual CEEC compared

y = individual West-European country or region compared

k = individual industry

sh_k^y = share of industry k in total output at constant prices of country y (in %)

sh_k^x = share of industry k in total output at constant prices of country x (in %)

3) For EU-North and EU-South, the reference year is 1992 throughout. – 4) Comparable 2-digit NACE data were available from 1990 onwards only; the figures have been aggregated from ISIC-statistics by WIIW. – 5) Until 1993, the Czech resp. Slovak part of former Czechoslovakia. – 6) As Romania production shares at constant prices do not seem reliable after 1993, from 1994 onwards shares at current prices were used for comparison with the EU instead. (1997 was the last year available.)

Source: compiled from the WIIW Industrial Database.

Table 5.2

PRODUCTION STRUCTURE (current prices)

		BULGARIA		CZECH REPUBLIC		HUNGARY		POLAND		ROMANIA		SLOVAK REPUBLIC		SLOVENIA		AUSTRIA		EU-N (3)	EU-South
		1993	1998	1993	1998	1993	1998	1993	1998	1993	***1997***	1993	1998	1993	***1997***	1993	1998	1996	1996
D	Manufacturing total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
DA	Food products; beverages and tobacco	25.2	24.8	19.4	17.1	28.1	18.9	27.3	24.6	23.6	21.9	17.9	14.7	15.4	15.4	17.5	12.5	15.3	22.9
DB	Textiles and textile products	6.6	6.8	6.3	4.6	5.3	3.7	7.2	5.6	8.2	6.3	5.3	4.3	8.4	7.1	5.1	3.7	3.6	9.6
DC	Leather and leather products	1.7	1.4	2.1	0.7	1.3	0.8	1.4	1.0	1.9	1.6	2.1	1.0	3.0	1.9	0.9	0.8	0.5	2.7
DD	Wood and wood products	2.6	1.2	2.0	2.4	1.6	1.4	2.8	3.5	2.1	2.2	1.8	3.3	3.7	3.3	3.0	4.6	1.4	2.8
DE	Pulp, paper & paper products; publishin	3.0	3.9	3.8	4.6	5.1	4.0	4.4	6.0	2.9	2.6	5.5	6.0	6.3	7.5	7.5	8.4	7.5	6.4
DF	Coke, refined petroleum products & nuc	10.1	11.3	6.0	2.5	9.4	5.8	8.6	3.9	10.2	10.5	9.2	5.9	1.2	1.0	3.2	4.6	5.2	7.0
DG	Chemicals, chemical products and man	8.6	10.0	6.7	6.4	10.9	8.0	7.0	6.9	8.8	9.1	9.3	6.8	10.6	10.5	8.4	6.5	10.6	8.8
DH	Rubber and plastic products	2.6	2.6	2.5	4.1	2.9	3.5	3.3	4.3	2.7	2.1	3.8	3.5	4.6	4.2	2.9	3.9	4.1	3.4
DI	Other non-metallic mineral products	4.2	4.8	5.4	5.9	4.0	3.2	4.4	4.9	3.4	5.3	4.9	5.0	4.6	4.7	6.0	5.1	3.1	6.1
DJ	Basic metals and fabricated metal prod	12.5	12.0	17.6	18.4	10.8	9.3	11.6	11.8	13.3	17.9	19.0	17.7	12.3	11.5	13.4	14.4	10.7	10.4
DK	Machinery and equipment n.e.c.	6.4	12.4	9.4	9.3	6.0	4.8	6.3	6.3	7.3	5.9	8.5	7.2	7.8	10.0	9.0	10.5	10.6	3.6
DL	Electrical and optical equipment	5.4	4.4	4.9	7.3	7.2	19.5	5.5	7.0	7.4	4.9	5.3	7.9	8.2	9.1	12.8	12.7	10.6	5.9
DM	Transport equipment	4.3	3.2	10.6	13.0	5.4	15.7	6.8	9.7	5.1	6.4	4.6	13.9	9.5	9.2	6.1	8.2	14.1	7.9
DN	Manufacturing n.e.c.	6.7	1.3	3.2	3.7	1.9	1.3	3.4	4.5	3.0	3.3	2.8	3.0	4.5	4.7	4.2	4.2	2.6	2.3

EMPLOYMENT STRUCTURE

		BULGARIA		CZECH REPUBLIC		HUNGARY		POLAND		ROMANIA		SLOVAK REPUBLIC		SLOVENIA		AUSTRIA		EU-N (3)	EU-South
		1993	1998	1993	1998	1993	1998	1993	1998	1993	1998	1993	1998	1993	1998	1993	1998	1996	1996
D	Manufacturing total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
DA	Food products; beverages and tobacco	10.7	16.2	9.3	12.0	20.7	18.1	17.7	18.6	10.1	12.6	10.9	11.6	7.5	9.1	11.3	11.6	11.2	17.2
DB	Textiles and textile products	13.5	18.3	11.0	9.9	14.4	15.4	14.9	13.8	18.3	18.7	11.7	11.3	17.3	15.0	7.9	5.6	6.4	19.2
DC	Leather and leather products	2.8	3.6	2.8	2.1	4.1	3.5	3.0	2.3	3.7	3.8	4.9	3.4	4.4	3.6	1.4	1.2	1.0	4.4
DD	Wood and wood products	3.4	2.2	1.9	3.1	2.4	2.2	3.5	4.3	3.1	4.0	3.1	4.9	4.9	4.8	2.8	5.7	1.9	3.7
DE	Pulp, paper & paper products; publishin	2.3	3.6	3.6	3.8	4.7	3.5	3.5	4.4	2.5	2.5	4.9	5.2	5.9	6.3	7.3	7.2	8.4	6.2
DF	Coke, refined petroleum products & nuc	1.8	1.9	1.5	0.3	2.8	2.3	0.9	0.8	1.4	1.6	1.6	1.0	0.2	0.1	0.7	0.5	0.4	0.8
DG	Chemicals, chemical products and man	6.0	6.4	4.7	3.8	6.6	5.8	5.0	4.7	5.8	5.3	6.2	4.9	4.5	5.4	6.3	4.5	7.4	5.5
DH	Rubber and plastic products	2.7	3.2	2.6	4.1	2.7	3.9	2.9	3.9	2.1	2.1	2.8	3.1	3.7	4.8	3.6	4.6	5.5	3.5
DI	Other non-metallic mineral products	4.9	5.1	6.1	6.2	4.7	4.7	6.2	5.9	5.3	5.6	6.2	5.8	4.7	4.9	6.1	5.7	3.7	7.3
DJ	Basic metals and fabricated metal prod	10.6	5.5	17.4	17.2	10.6	8.9	11.4	11.8	12.2	11.7	11.5	14.9	15.0	14.0	15.8	16.2	13.0	11.1
DK	Machinery and equipment n.e.c.	13.9	21.0	16.6	13.9	8.8	8.1	11.5	9.5	15.1	12.8	17.1	13.7	9.6	10.2	10.4	12.2	12.4	4.5
DL	Electrical and optical equipment	8.6	6.5	8.4	9.9	9.4	14.3	6.7	6.4	5.4	4.6	8.5	10.2	11.0	11.2	14.3	12.3	12.6	5.3
DM	Transport equipment	6.7	3.2	9.2	8.0	4.5	6.1	7.9	7.1	8.5	8.3	6.1	5.2	6.2	4.5	5.0	5.6	12.0	6.3
DN	Manufacturing n.e.c.	12.1	3.2	5.0	5.7	3.5	3.1	4.9	6.5	6.6	6.3	4.5	4.8	5.1	6.1	7.0	7.1	4.1	4.9

6 Some conjectures on the dynamics of comparative advantage

Patterns of catching-up

Comparative advantage switchovers

In this section we shall summarize the results of a recent study (see Stehrer, Landesmann, Burgstaller, 2000) which attempted to analyse the dynamics of catching-up at the industrial level.

We report the results of the estimation of a simple (standard) model of ‘convergence/catching-up’ at the level of individual industries and show that the estimates of convergence parameters point in the direction of an interesting dynamics of comparative advantage for catching-up economies which might explain the pattern observed for some of the CEECs (see also sections 2 and 4 of the paper). A model of this type has been widely estimated at the level of aggregate economies, but seldom at the level of individual industries upon which the following analysis will focus.

As the time series for the CEECs are rather short for the period after the transition, and especially after the first impact of the transformational recession, it is nearly impossible to estimate a catching-up model for the CEECs after say 1993. We therefore try to look at the historical experiences of a larger group of catching-up economies (comprising Southern EU economies, and a set of Asian and Latin American economies) to obtain some estimates concerning the ‘structural dynamics of catching-up’ which serves as a background to evaluate the industry-level developments we observe in CEECs.

We shall first look at catching-up patterns in *productivity levels* and *wage rates*, the variables which have already been referred to in section 2 of this paper, and we shall then report the results of a convergence analysis for the variable introduced in section 4b, namely export unit values, which we have interpreted as an indicator for *product quality*.

Let us first sketch a simple modelling approach to convergence/catching-up:

We define the productivity, wage or product quality gap as

$$G^{c}_{t} = \ln(v_t^c/v_t^L) = \ln(v_t^c)\text{-}\ln(v_t^L) \qquad (1)$$

where v denotes the considered variables (OUTPROD, VALPROD, WAGEMP or QUALITY)[10], C is the country index, L stands for a leader or lead group, and t represents time. The long run motion of the productivity (either for OUTPROD or VALPROD) or wage or quality gap G is estimated by OLS regression on a constant and a time trend t.

[10] OUTPROD and VALPROD refer respectively to output per employee and value added per employee, WAGEMP for wages per employee, QUALITY for the export unit price variable defined in section 4b.

$$G^c_t = \alpha_0 + \Phi^c\, t + \varepsilon \qquad (2)$$

This estimator uses the whole time series information on G^c_t and not just the first and last point. Thus the OLS estimator is robust with respect to short term effects of shocks and cycles. Φ^c denotes the growth rate of the gap in country c over the period. The last step is to regress the growth rate on the initial technology gap:

$$\Phi^c = \beta_0 + \beta^c_1\, G^c_0 + \varepsilon \qquad (3)$$

Similarly, Barro and Sala-i-Martin (1997) present a model of catching up to the technology leader, where the growth rate of output per worker in the catching-up country depends on the growth rate of the leading country, the gap, and the steady-state level of the gap.[11,12]

6a Productivity and wage catching-up

Table 6.1 reports the results of regression (3) for the three variables estimated over a wide range of countries excluding the CEECs (see Stehrer, Landesmann, Burgstaller, 1999, for details).

Table 6.1

Cross-country regression[1)]

Total manufacturing – 300

	OUTPROD	VALPROD	WAGEMP
Coeff.	-0.024	-0.018	-0.016
t-value	-4.940	-3.575	-4.171
Std.Dev.	0.005	0.005	0.004
R squ.	0.449	0.299	0.367
R squ. Adj.	0.430	0.275	0.346
F-value	24.410	12.780	17.400

1) Estimated over the period 1965-95 for a large country dataset comprising all the OECD countries and a group of Asian and Latin American economies; the dataset was compiled from UNIDO statistics.

11 Barro/Sala-i-Martin (1995) propose to run non-linear least squares regressions of the form $\Phi = \beta_0 + [(1-\exp(\beta_1 T)/T]\, G_0 + \varepsilon$

to average over the time span. The results are very similar to the linear regressions and thus we report only the latter ones.

12 Verspagen (1992) proposes a non-linear form of equation (3), namely:

$\Phi^c = \beta_0 + \beta_1 P + \beta^c{}_2 G^c{}_0 \exp^{\beta 3(G_0/E)} + \varepsilon$ (3a)

β_1 estimates the effect of an exogenous rate of knowledge growth in the backward country (proxied for example by patent data, R&D expenditures, etc. and represented by variable P in 3a). The third term introduces a non-linear relationship between the initial gap and a parameter E measuring endowment with human capital, education, infrastructure, etc.

All coefficients have the expected negative sign, i.e. showing evidence for convergence, and are significant at least at the 5% level. The speed of convergence of the technology gap can be computed from the estimated coefficients β_1. A coefficient of 0.024 (such as the one estimated for productivity level catching-up) implies that 2.4% of the gap vanishes in one year. The average half life – i.e. the time period necessary to reduce the initial gap by one half – would then be $\ln(0.5)/\beta_1 = \ln(0.5)/(-0.024) \approx 28$ years. The coefficient for wage convergence is much lower, $\beta_1 = -0.016$, and thus predicts a half life time of about 43 years. But this effect is mainly due to the inclusion of the NIC2 country group. Running the regression without this group gives a coefficient of –0.026 and a R^2 of 0.76.

Time series analysis

The type of cross-country study used above has been criticized for statistical reasons, known as Galton's fallacy (see e.g. Quah, 1993a and 1993b, and Friedman, 1992). Instead, time series methods are proposed to test for convergence and/or divergence. Here we use a simple unit-root test proposed by Ben-David (1993 and 1996) to study the relationship between trade and growth between countries. This test is in fact a Dickey-Fuller test which can also be applied to our data set. Thus we test for convergence of the above mentioned country groups (in fact, each individual country could also be used). For this test we define the technology and wage gap as above

$$G^c_t = \ln(v_t^c/v_t^L) = \ln(v_t^c)-\ln(v_t^L) \qquad (1)$$

and use a simple unit root test

$$G^c_{t+1} = \Phi\, G^c_t$$

Defining $G^c_{t+1} = \Delta G^c_{t+1} + G^c_t$ one gets

$$\Delta G^c_{t+1} = (\Phi-1)\, G^c_t \equiv \kappa\, G^c_t \qquad (4)$$

which is known as Dickey-Fuller test. The lower the κ the faster is the convergence process. $\kappa < 0$ means convergence, $\kappa > 0$ divergence. The half-life time can easily be computed by $\ln(0.5)/\kappa$ in case of convergence, the double-life time by $\ln(2)/\kappa$. Table 6.2 presents the results for eight country groups (excluding CEECs).

Table 6.2

Results of the Dickey-Fuller test

Total manufacturing – 300

	OUTPROD			VALPROD			WAGEMP		
	Coefficient	**t-value**	**Half-time**	**Coefficient**	**t-value**	**Half-time**	**Coefficient**	**t-value**	**Half-time**
CAN	-0.050	-1.424	14.0	-0.012	-0.669	59.4	-0.043	-2.569 **	16.0
EUN	-0.032	-2.470 **	22.0	-0.018	-2.112 **	38.4	-0.052	-5.418 ***	13.3
EUS	-0.027	-2.858 ***	25.7	-0.022	-3.105 ***	31.7	-0.040	-5.537 ***	17.4
SCA	-0.022	-2.290 **	31.9	-0.010	-1.153	71.4	-0.024	-3.381 ***	28.9
JAP	-0.086	-3.825 ***	8.1	-0.057	-3.712 ***	12.1	-0.058	-10.219 ***	12.0
OZE	-0.005	-0.396	138.3	-0.006	-0.707	111.5	-0.022	-1.438	31.5
NIC1	-0.020	-1.817 *	35.5	-0.027	-2.643 **	25.8	-0.030	-4.521 ***	23.3
NIC2	-0.020	-1.416	34.4	-0.019	-1.181	36.2	-0.005	-1.123	134.6

The estimated coefficient κ for OUTPROD is negative in all cases but not significant for CAN and OZE and only significant at the 5% level for NIC2. The average half-time is about 27 years (including only country groups with significant coefficients), which is equal to the half-time from the cross-section analysis above. The fastest catching-up country is JAP with a half-time of about 8.3 years. All other countries exhibit half-times of about 20-25 years. (The speed of convergence would change if one alters the time-period; especially for NIC1 the catching-up process would be much faster starting e.g. with the year 1975).

The results for the catching-up process for WAGEMP again shows negative signs in all cases and are higher for all countries with the exception of JAP and NIC2. Thus the half-time in almost all countries is lower (with the above mentioned exceptions), the average half-time is about 20 years and thus lower than that for productivity growth. With the exceptions of CAN, JAP, and NIC2 wages are converging faster than output productivity.

The results from this time series analysis reveal a considerable diversity of catching-up parameters obtained for productivity and wage catching-up across economies.

Catching up at the disaggregated/industrial level

After looking at the convergence patterns at the aggregate manufacturing level, we now present evidence on the convergence patterns at a more disaggregated level (3-digit ISIC, rev. 2) to show differences between higher-tech and lower tech sectors. In this section we only include two typical low-tech sectors (textiles ISIC321 and wearing apparel ISIC322) and two typical high- or medium-tech sectors (non-electrical machinery ISIC381 and electrical machinery ISIC383).

We use the same methodology introduced above and compare the two sectors with regard to their prospects and performance of convergence and catching-up.

The Coefficient of Variation

As first indicator of convergence we discuss the development of the coefficient of variation (CoV) in the four industries. The CoVs for both types of industries are presented in Table 6.3.

Table 6.3

Coefficient of Variation

	1965	1970	1975	1980	1985	1990	1995
Textiles – 321							
OUTPROD	0.388	0.051	0.371	0.412	0.380	0.363	0.461
VALPROD	0.417	0.486	0.430	0.551	0.433	0.475	0.703
WAGEMP	0.508	0.595	0.514	0.466	0.440	0.385	0.405
Wearing apparel – 322							
OUTPROD	0.360	0.402	0.361	0.362	0.397	0.363	0.401
VALPROD	0.434	0.452	0.433	0.410	0.381	0.360	0.455
WAGEMP	0.512	0.502	0.487	0.464	0.446	0.418	0.411
Machinery (except electric) – 382							
OUTPROD	0.433	0.421	0.422	0.386	0.456	0.427	0.477
VALPROD	0.482	0.465	0.464	0.436	0.513	0.510	0.536
WAGEMP	0.514	0.496	0.490	0.450	0.444	0.401	0.390
Machinery electric – 383							
OUTPROD	0.345	0.309	0.284	0.241	0.230	0.219	0.265
VALPROD	0.417	0.380	0.385	0.367	0.350	0.364	0.432
WAGEMP	0.483	0.464	0.476	0.449	0.435	0.381	0.356

In the two lower-tech industries (textiles and wearing apparel) the coefficient of variation for OUTPROD is rather stable over the longer period at a level of about 0.4 and is only slightly decreasing for the value-added productivity variable in industry ISIC322 (wearing apparel). Wages per employee show a more dynamic pattern. In industry ISIC321 (textiles) the CoV is decreasing from a level of 0.6 in 1970 to about 0.4 and similarly in industry ISIC322 falling from 0.5 in 1965 to also 0.4 in 1995. The higher tech sectors show a somewhat different picture. Whereas the coefficient in industry ISIC382 (non-electrical machinery) is starting at a level of about 0.45 there is a tendency to rise over time to 0.5 in 1995. The coefficient of variation for wages in this industry is again falling from 0.5 at the beginning to 0.4 in 1995. Sector ISIC383 (electrical machinery) differs somewhat. First, the starting level with 0.35 is lower than in the other sectors and is falling to 0.2 in 1990. The CoV for VALPROD, starting at 0.4, is falling slightly over time. On the other hand, wage dispersion shows more or less the same picture as in the other industries and is falling from a level of about 0.5 to 0.35 in 1995. This shows that productivity levels behave more diversely between countries in the different industries than wage levels. It points towards a wage drift across countries which – combined with differences in productivity catching-up patterns across industries – generates a dynamic in the structure of comparative cost advantages. If – in a particular industry – productivity increases are not fully captured by (relative) wage increases a comparative advantage emerges. These results must be seen as a partial picture, as we only use data on labour productivity and hence differences and/or changes in total factor productivities (across industries and countries) are not accounted for.

Cross-country estimates of industry-level convergence

The same cross-country methodology as applied above to aggregate manufacturing is now applied to each of the four sectors. Table 6.4 presents the results of the cross-country analysis of convergence patterns (equation 3) at the industrial 3-digit level for the four industries.

Again, all the coefficients have a negative sign and are significant thus indicating convergence. Further, the coefficients for the productivity measures (OUTPROD and VALPROD) are higher than the coefficients for wages (WAGEMP). The striking difference is if one compares the two types of sectors. The coefficients for the two low-tech sectors (textiles and wearing apparel) are much lower than for the medium-/high-tech sectors. The half time of convergence in the low-tech sectors is 27 years in textiles and about 46 years in wearing apparel, whereas the half time in non-electrical machinery and in electrical machinery is about 20 years. (One has to keep in mind, though, that not all differences in coefficients are statistically significant.) This indicates faster convergence in the higher-tech sectors. On the other hand, the coefficients for wage catching-up are quite similar across the sectors, which indicates again that a wage drift exists, as discussed above. Hence, catching-up countries are losing comparative advantages in the low-tech sectors. The two main results can be summarized as follows: First, the two medium-/high-tech sectors (non-electric machinery ISIC382 and electrical machinery, ISIC383) show higher coefficients for the productivity variables OUTPROD and VALPROD (although not statistically different from the other sectors in most cases) than the other two sectors, which indicates faster catching up in these sectors. Second, the estimated coefficient for the wage variable WAGEMP is very similar in all sectors with a minimum of 0.15 and a maximum of 0.22.

Table 6.4

Results of cross-country regressions – selected industries[1)]

	OUTPROD	VALPROD	WAGEMP
Textiles 321			
Coeff.	-0.025	-0.024	-0.017
t-value	-5.131	-3.707	-3.697
Std.Dev.	0.005	0.006	0.005
R squ.	0.467	0.314	0.336
R squ. Adj.	0.450	0.291	0.311
F-value	26.330	13.740	13.670
Wearing apparel 322			
Coeff.	-0.015	-0.016	-0.018
t-value	-1.624	-2.638	-4.466
Std.Dev.	0.009	0.006	0.004
R squ.	0.081	0.188	0.408
R squ. Adj.	0.050	0.161	0.387
F-value	2.634	6.960	19.950
Machinery (except electric) 382			
Coeff.	-0.035	-0.030	-0.018
t-value	-5.440	-5.557	-4.799
Std.Dev.	0.006	0.005	0.004
R squ.	0.505	0.516	0.451
R squ. Adj.	0.488	0.499	0.432
F-value	29.600	30.880	23.030
Machinery electric 383			
Coeff.	-0.033	-0.029	-0.016
t-value	-5.190	-3.898	-3.832
Std.Dev.	0.006	0.008	0.004
R squ.	0.473	0.336	0.336
R squ. Adj.	0.456	0.314	0.313
F-value	26.930	15.190	14.690

1) Estimated over the period 1965-95.

The dynamics of comparative advantage

Let us briefly summarize the results obtained and their relevance for interpreting the observations we made with respect to industry level productivity, wage and labour unit cost movements in CEECs in section 2. The econometric analysis revealed the following features:

– Catching-up patterns differ (as one would expect) across different economies.

– There are also differences across countries in the relative catching-up parameters obtained for wage catching-up and productivity catching-up.

– At a disaggregated level, we observed a wider diversity in productivity catching-up across industries than in wage catching-up which we interpret as evidence for a wage-drift.
– In the sample as a whole, we found that the estimated productivity catching-up parameters were higher in the 'medium-/high-tech' industries than in the 'low-tech' industries, while the estimated wage catching-up parameters were more uniform.

The above results have important implications for potential switchovers in the 'comparative advantage' positions of catching-up economies from 'low-' to 'medium- to high-tech' branches even when the absolute productivity (and wage) gap is still high. We elaborate these comparative advantage dynamics in some detail in Landesmann and Stehrer (2000).

6b Product quality catching-up by CEE producers in EU markets

We shall now report some of the econometric results obtained from applying the same convergence/catching up model to export unit values which, as discussed in section 4b, are interpreted as 'product quality' indicators.

We start again with estimates for a large sample of countries.[13] The indicator was calculated for each year from 1977 up to 1996 except for 1980-82 because data were lacking. We interpolated values for these years assuming constant growth rates. The specific industries (ISIC classification) are 321 (textiles), 322 (wearing apparel), 323 (here leather products and footwear are subsumed), 382 (mechanical engineering), 383 (electrical engineering) and 385 (professional goods).

We had to name a 'price/quality leader' to whom convergence shall be examined throughout this study since actual price leadership can be changing with industry and time. We decided that a group of countries comprising the six core EU countries (Germany, France, Italy, Belgium, the Netherlands and the United Kingdom) and the USA should play this role (referred to as USAEUN).

Cross-country industry-level regressions on quality catching-up

We tried to account for differences in convergence between industries by dividing the sample into two groups of industries (engineering comprising ISIC industries 382, 383, 385 and textiles, clothing and leather products comprising ISIC industries 321, 322, 323) and into country groups. From 1993 on, the country groups consist of Hungary, Poland, Czech Republic, Slovenia, Slovak Republic and the Baltic countries (CEECW) and Bulgaria,

[13] The country sample is wider than the one used for the productivity and wage catching-up analysis above. It includes again the Southern EU economies and a wider range of Asian and Latin American economies.

Romania, Russia, Ukraine and the rest of the CIS nations (CEECE). Unfortunately, the number of industries and years here is too small to dig deeper into differences across countries and country groups.

The results, of linear as well as panel regressions, are given in Table 6.5. The first case comprises 18 countries from the above-mentioned groups. With linear regressions, the β-coefficients are negative and significant. The average half life can be calculated as $\ln(0,5)/\beta_1$, resulting in approximately 33 years when looking at the equation including all of the six industries. Convergence is found to occur faster in the textiles, clothing and leather products industries. The panel regressions show a similar picture. Both models, fixed and random effects, are given and can be technically discriminated by LM and Hausman tests.

In a next step, only the seven CEECs (Hungary, Poland, Czech Republic, Slovenia, Bulgaria, Romania and Russia) are in the sample with data starting in 1991. The estimated parameter for convergence speed is now much higher leading to an average half life of about 10 years (when covering all six industries). Again, the process is faster for textiles etc., and β_1 is insignificant for the engineering industries potentially because of a delayed and slow closure of the gap for some countries within the CEECE group especially for industries 382 and 385. This is confirmed by a highly significant estimate of β_1 of -0,094 (resulting in a half life of 7.37 years!) in the linear regression which includes only the four 'Western' CEECs.

When looking at the period after 1993, it is possible to include more CEE countries (Slovakia, the group of Baltic countries, the Ukraine and a 'Rest of CIS'-group); the estimated parameter rises to -0.149 (estimated average half life is 4.65 years!) in the linear regression including all industries. But now the closure of the gap in export prices seems to be somewhat faster for the engineering industries. Again, the more 'Western' CEE countries seem to be able to reduce their gap faster (see the estimates for only the six countries).

These high values obtained for the convergence parameter from the regressions for the CEECs (with those from the panel regressions even higher than the ones obtained from linear regressions) may stem from a nonlinear relationship between the gap and the speed of convergence which we did not incorporate here. The implication of such a nonlinearity would be a slowing down of the convergence speed in the following years.

Some of the results given here are not too reliable in a statistical sense because of the low numbers of degrees of freedom in some of the panel estimations.

Table 6.5

Regression results (price gap variables)

country group, method and time period as indicated

18 countries: Southern EU, South America, Southeast Asia, China, India

LINEAR REGRESSION

Total (6 industries)		***Textile industries***		***Engineering industries***	
coefficient	-0.021	coefficient	-0.036	coefficient	-0.016
s. d.	0.005	s. d.	0.008	s. d.	0.007
t-value	-4.339 ***	t-value	-4.642 ***	t-value	-2.338 **
R sq.	0.152	R sq.	0.293	R sq.	0.097
R sq. adj.	0.144	R sq. adj.	0.279	R sq. adj.	0.079
F-value	18.830 ***	F-value	21.540 ***	F-value	5.470 **
obs.	107	obs.	54	obs.	53

FIXED-EFFECTS

Total (6 industries)		***Textile industries***		***Engineering industries***	
coefficient	-0.026	coefficient	-0.030	coefficient	-0.026
s. d.	0.005	s. d.	0.007	s. d.	0.008
t-value	-4.860 ***	t-value	-4.112 ***	t-value	-3.307 ***
R sq. within	0.212	R sq. within	0.326	R sq. within	0.243
R sq. between	0.010	R sq. between	0.286	R sq. between	0.001
F-value	23.620 ***	F-value	16.910 ***	F-value	10.940 ***
obs.	107	obs.	54	obs.	53

RANDOM EFFECTS

Total (6 industries)		***Textile industries***		***Engineering industries***	
coefficient	-0.022	coefficient	-0.033	coefficient	-0.017
s. d.	0.005	s. d.	0.007	s. d.	0.007
t-value	-4.472 ***	t-value	-4.804 ***	t-value	-2.607 ***
Wald	20.000 ***	Wald	23.080 ***	Wald	6.800 ***
obs.	107	obs.	54	obs.	53
LM test	0.470	LM test	9.420 ***	LM test	0.640
Hausman	3.650 *	Hausman	0.450	Hausman	4.300 **

7 countries: Hungary, Czech Rep., Poland, Slovenia, Bulgaria, Romania, Russia; since 1991

LINEAR REGRESSION

Total (6 industries)		***Textile industries***		***Engineering industries***	
coefficient	-0.068	coefficient	-0.064	coefficient	-0.052
s. d.	0.023	s. d.	0.023	s. d.	0.055
t-value	-2.969 ***	t-value	-2.770 **	t-value	-0.940
R sq.	0.181	R sq.	0.288	R sq.	0.045
R sq. adj.	0.160	R sq. adj.	0.250	R sq. adj.	-0.006
F-value	8.810 ***	F-value	7.670 **	F-value	0.880
obs.	42	obs.	21	obs.	21

FIXED-EFFECTS

Total (6 industries)		***Textile industries***		***Engineering industries***	
coefficient	-0.109	coefficient	-0.128	coefficient	-0.130
s. d.	0.029	s. d.	0.046	s. d.	0.084
t-value	-3.793 ***	t-value	-2.796 **	t-value	-1.540
R sq. within	0.297	R sq. within	0.376	R sq. within	0.154
R sq. between	0.039	R sq. between	0.323	R sq. between	0.026
F-value	14.390 ***	F-value	7.820 **	F-value	2.370
obs.	42	obs.	21	obs.	21

RANDOM EFFECTS

Total (6 industries)		***Textile industries***		***Engineering industries***	
coefficient	-0.076	coefficient	-0.075	coefficient	-0.052
s. d.	0.024	s. d.	0.027	s. d.	0.055
t-value	-3.203 ***	t-value	-2.798 ***	t-value	-0.94
Wald	10.260 ***	Wald	7.830 ***	Wald	0.880
obs.	42	obs.	21	obs.	21
LM test	0.340	LM test	0.430	LM test	1.040
Hausman	4.140 **	Hausman	2.020	Hausman	1.500

*** significant at the 1 % level
** significant at the 5 % level
* significant at the 10 % level

Table 6.5 ctd.

Regression results (price gap variables)

country group, method and time period as indicated

11 countries: Hungary, Czech Rep., Poland, Slovenia, Bulgaria, Romania, Russia, Slovakia, Baltic countries, Ukraine, Rest of GUS; since 1993

LINEAR REGRESSION

Total (6 industries)			*Textile industries*			*Engineering industries*		
coefficient	-0.149		coefficient	-0.133		coefficient	-0.164	
s. d.	0.024		s. d.	0.027		s. d.	0.045	
t-value	-6.316	***	t-value	-4.929	***	t-value	-3.617	***
R sq.	0.384		R sq.	0.439		R sq.	0.297	
R sq. adj.	0.374		R sq. adj.	0.421		R sq. adj.	0.274	
F-value	39.890	***	F-value	24.300	***	F-value	13.090	***
obs.	66		obs.	33		obs.	33	

FIXED-EFFECTS

Total (6 industries)			*Textile industries*			*Engineering industries*		
coefficient	-0.167		coefficient	-0.161		coefficient	-0.193	
s. d.	0.032		s. d.	0.057		s. d.	0.044	
t-value	-5.294	***	t-value	-2.840	**	t-value	-4.386	***
R sq. within	0.342		R sq. within	0.278		R sq. within	0.399	
R sq. between	0.464		R sq. between	0.620		R sq. between	0.006	
F-value	28.020	***	F-value	8.070	***	F-value	19.240	***
obs.	66		obs.	33		obs.	33	

RANDOM EFFECTS

Total (6 industries)			*Textile industries*			*Engineering industries*		
coefficient	-0.158		coefficient	-0.134		coefficient	-0.188	
s. d.	0.026		s. d.	0.028		s. d.	0.043	
t-value	-5.99	***	t-value	-4.793	***	t-value	-4.39	***
Wald	35.880	***	Wald	22.970	***	Wald	19.270	***
obs.	66		obs.	33		obs.	33	
LM test	6.800	***	LM test	0.000		LM test	5.610	**
Hausman	0.310		Hausman	0.300		Hausman	0.200	

6 countries: Hungary, Czech Rep., Poland, Slovenia, Slovakia, Baltic countries; since 1993

LINEAR REGRESSION

Total (6 industries)			*Textile industries*			*Engineering industries*		
coefficient	-0.193		coefficient	-0.180		coefficient	-0.208	
s. d.	0.024		s. d.	0.042		s. d.	0.038	
t-value	-8.100	***	t-value	-4.267	***	t-value	-5.491	***
R sq.	0.659		R sq.	0.532		R sq.	0.653	
R sq. adj.	0.649		R sq. adj.	0.503		R sq. adj.	0.632	
F-value	65.600	***	F-value	18.210	***	F-value	30.150	***
obs.	36		obs.	18		obs.	18	

FIXED-EFFECTS

Total (6 industries)			*Textile industries*			*Engineering industries*		
coefficient	-0.183		coefficient	-0.166		coefficient	-0.240	
s. d.	0.036		s. d.	0.138		s. d.	0.028	
t-value	-5.122	***	t-value	-1.208		t-value	-8.544	***
R sq. within	0.475		R sq. within	0.117		R sq. within	0.839	
R sq. between	0.908		R sq. between	0.806		R sq. between	0.001	
F-value	26.230	***	F-value	1.460		F-value	72.990	***
obs.	36		obs.	18		obs.	18	

RANDOM EFFECTS

Total (6 industries)			*Textile industries*			*Engineering industries*		
coefficient	-0.193		coefficient	-0.180		coefficient	-0.238	
s. d.	0.024		s. d.	0.042		s. d.	0.029	
t-value	-8.100	***	t-value	-4.267	***	t-value	-8.328	***
Wald	65.600	***	Wald	18.210	***	Wald	69.360	***
obs.	36		obs.	18		obs.	18	
LM test	0.310		LM test	0.280		LM test	8.530	***
Hausman	0.140		Hausman	0.010		Hausman	0.000	

*** significant at the 1 % level
** significant at the 5 % level
* significant at the 10 % level

In conclusion: The analysis of catching-up processes in export prices as indicators of product quality complements well the analysis of productivity levels and of wage rates conducted in section 6A. We found generally significant (econometric) evidence for convergence processes in export prices across a wide range of international suppliers. Interestingly, while the estimated catching-up parameters for the wide sample of suppliers to EU markets including those from Southern Europe, South America and South and South-East Asia over the long estimation period 1977-1996 were bigger for the (more labour-intensive) branches textiles, clothing and leather products than for the technologically more sophisticated engineering branches, the opposite was the case for the parameters estimated for the Central and Eastern European countries over the shorter period 1991-96 and even more so for the group of 'Western' CEECs. Hence our conclusion in section 6A concerning the potential for relatively fast catching-up processes in the (technologically) more advanced engineering branches in the case of the more advanced group of CEECs is also confirmed here by our analysis of the catching-up processes in export prices as indicators for product quality.

7 Structural change in Central and Eastern Europe, EU accession and the further course of East-West European integration: concluding remarks

Let us conclude with some remarks on the impact of EU accession on the further processes of structural transformation and East-West European integration.

East-West European economic integration has proceeded at a very rapid rate since the beginning of the transition in 1989. It has led to a dramatic process of trade integration and substantial FDI flows which (together with other forms of cross-border corporate activities, such as outward processing trade, OPT) have paved the way to important production linkages between sites in Central and Eastern Europe and those in Western Europe. At least at the start of the transition, there were also substantial population and labour flows between CEE and the EU and, with EU accession, these are expected to increase again. Hence we can speak of three forms of integration:

– through product markets via increased trade flows,

– through capital markets via FDI flows and other forms of cross-border firm activities,

– directly through labour markets via the international/inter-regional mobility of labour.

There are interesting issues involved in the extent to which these three different channels through which East-West European integration proceeds complement or substitute for one another. There is a large theoretical literature which analyses under which circumstances one or the other is the case (see e.g. Markusen, 1983). This issue is important to be able to evaluate to which extent full accession to the EU – which implies full liberalization of relationships on all these three channels – will affect the structures of East-West European integration as against the current situation in which integration proceeds almost solely through the first two channels which are mostly, but not fully, liberalized, while the third channel is very highly restricted. Even concerning the first two channels, full membership of the EU implies a further regime change as it implies: full membership of the Single Market arrangements, a dismantling of border controls, complete liberalization of access by member firms to each others' markets, the adoption of EU competition policy rules, of the Common External Trade Policy, etc. This amounts to a much higher degree of liberalization of economic relationships between the CEECs and the EU and will have a further impact upon the patterns of integration and specialization in Europe.

The increased integration between the acceding countries and the EU will also affect the countries which are lagging in the accession process. There is a discussion amongst economists as to whether the sequential process by which EU accession will most likely proceed will have negative or positive effects on the 'laggards', the 'left-outs' and the 'stay-outs' (on this issue, see the contributions in Landesmann and Rosati, 2000). The issue here is whether the ease of access to EU markets, the increased attractiveness for FDI, the speeding up of convergence in macro- and microeconomic policies and in the legislative process of the 'first-rounders' will increase further the gaps between them and the other transition countries or whether the movement of the EU borders to the east will yield the benefits of contiguity and of spillovers also to those countries which do not have the prospects to join the EU in the short- or even medium-term.

The enormous diversity ('West-East Gefälle') in the development patterns of the different CEECs emerged clearly in almost every section of the paper, with very dynamic patterns of catching-up being observed for some of the CEE countries bordering with the EU and sluggishness in structural (including behavioural) transformation of the countries further east. The fate of this differentiation process is closely linked to the issue discussed above on whether EU accession of a first group of candidate countries will further increase the gap to the other CEE economies and, furthermore, whether patterns of structural change and specialization get cemented ('hysteretic effects') or will gradually follow the developmental patterns observed for the more advanced transition economies. Economists can at this stage not forecast which of these two scenarios is likely to emerge.

It is clear that structural change (just as the transition process itself) has quantitative as well as qualitative aspects to it. The quantitative aspects (such as evidenced by the analysis of 'convergence in structures' or of purely quantitative measures of productivity level catching-up) do convey the outward symptoms of differences in developmental levels, of catching-up or lack of catching-up and convergence in structural or behavioural terms. However, there is a qualitative side to the transformation and the catching-up processes which would require a deeper analysis of the interaction between institutional change and behavioural change, of the transformation of organizational structures at the microeconomic level, of the complicated interface between political, economic and cultural change which is at the root of why transformation processes take one course or another, of why development takes place or is stalling, why the conditions for EU accession can be fulfilled within a particular time horizon in some CEECs and not in others. It is clear that our understanding of the qualitative side of transformation and developmental processes is far less advanced than of the quantitative side and the analysis provided in this paper is testimony to this. Nonetheless, the description and systematic assessment of ‘symptoms’ is a necessary component of a proper diagnosis.

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APPENDIX A

Figures

Figure 4.1a

Representation of the most labour-intensive industries in exports to the EU

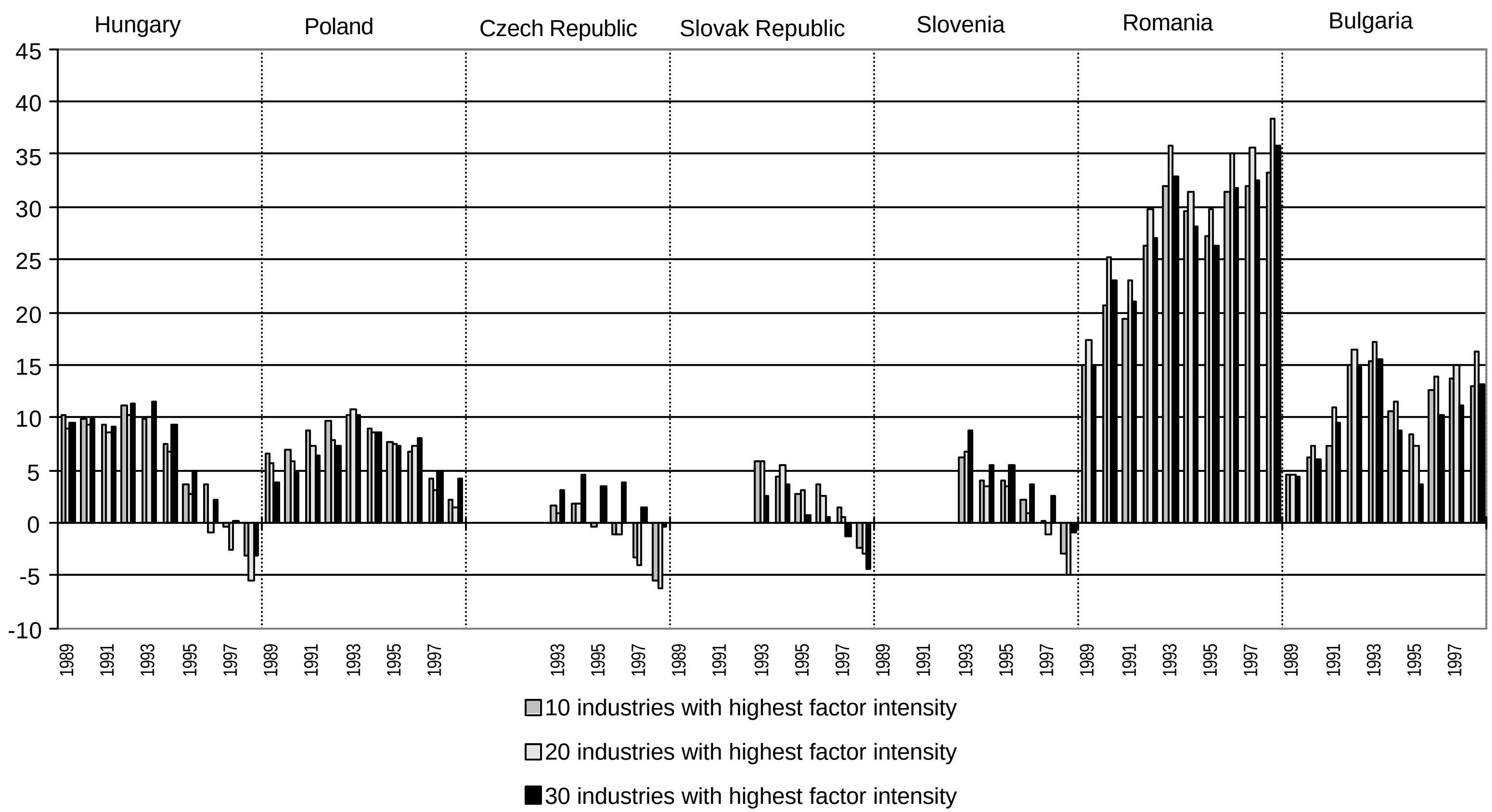


Figure 4.1b

Representation of the most capital-intensive industries in exports to the EU

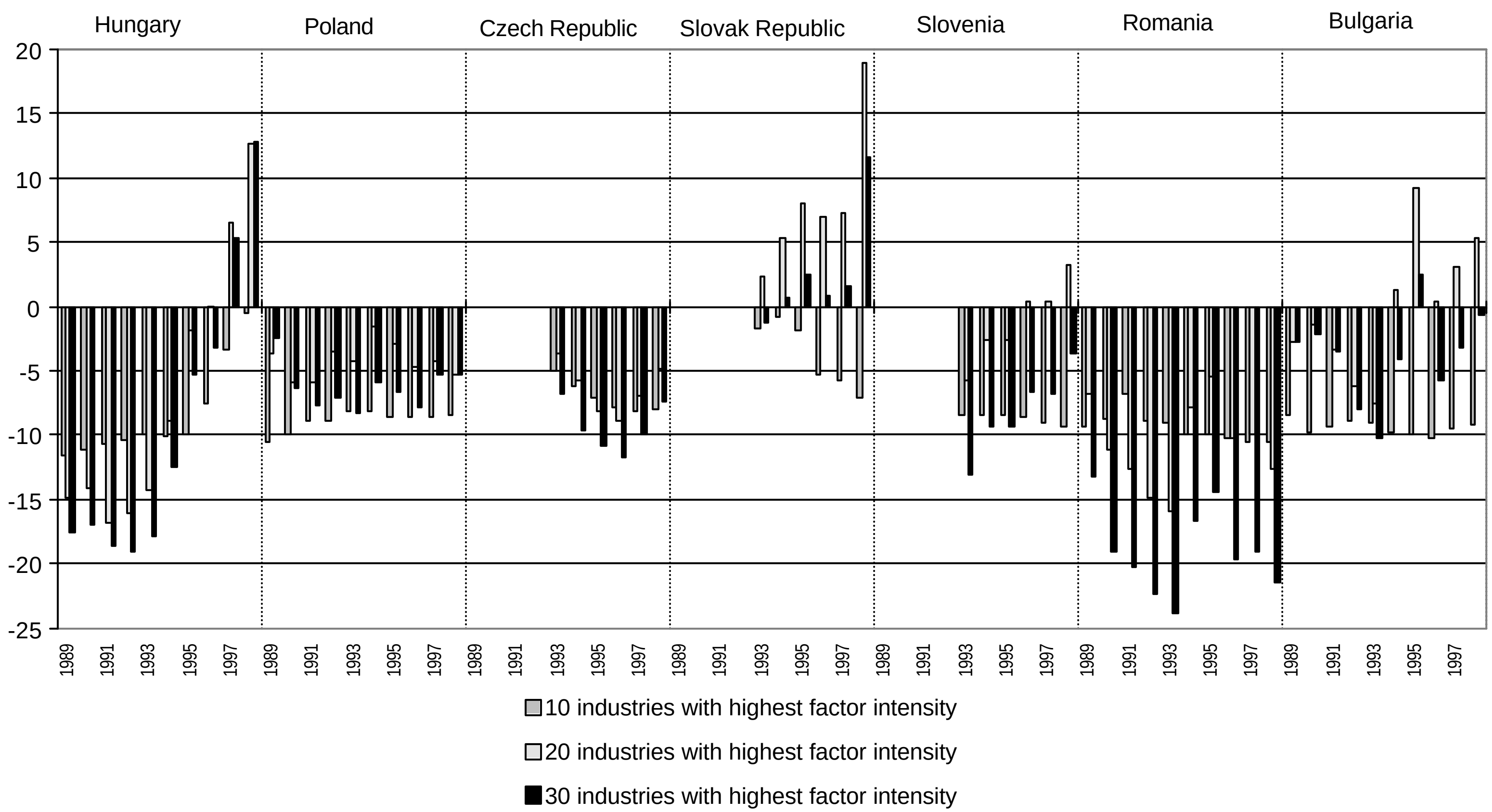
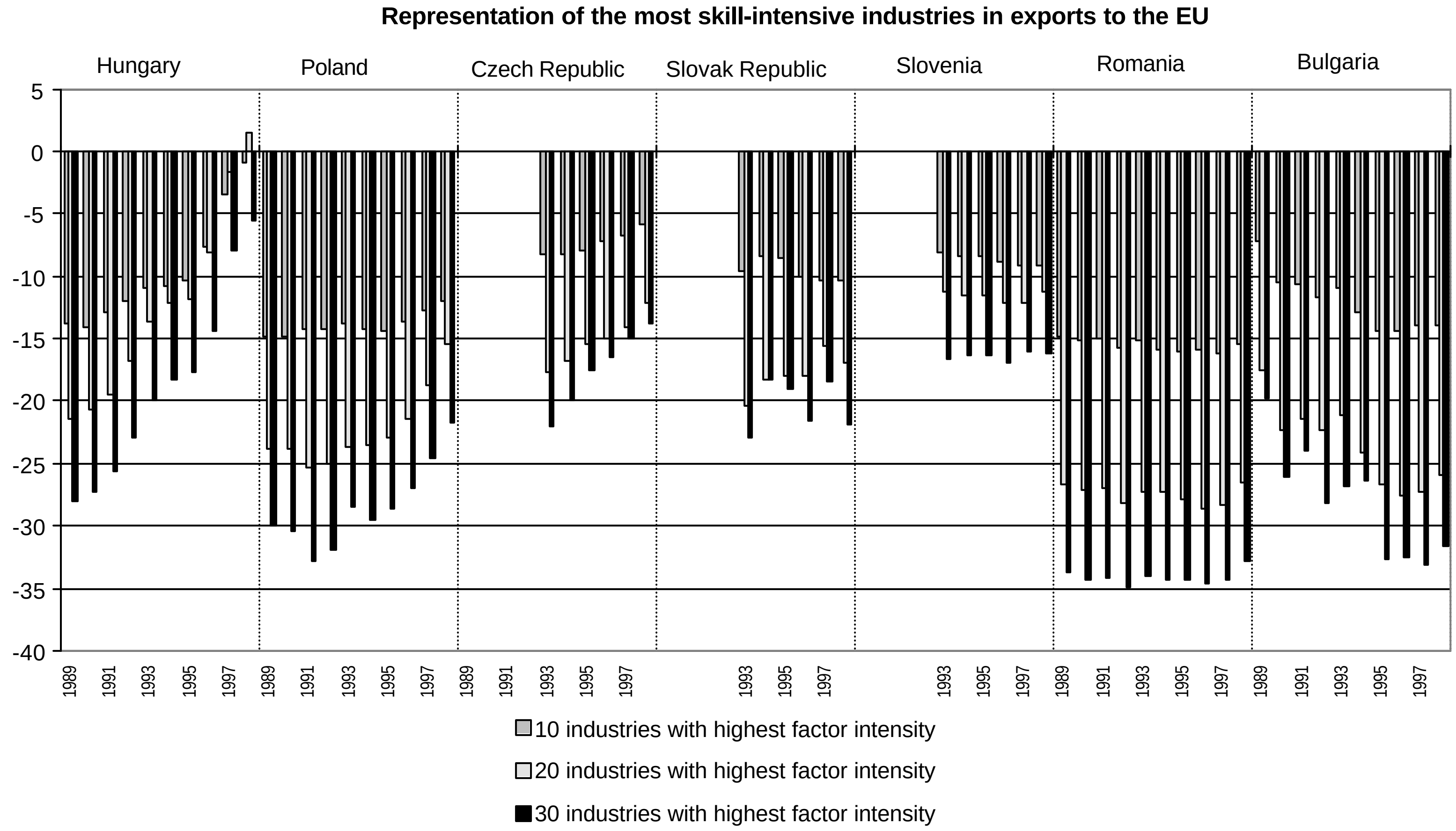


Figure 4.1c



Representation of the most skill-intensive industries in exports to the EU
Hungary
Poland
Czech Republic
Slovak Republic
Slovenia
Romania
Bulgaria
5
0
-5
-10
-15
-20
-25
-30
-35
-40
1989
1991
1993
1995
1997
10 industries with highest factor intensity
20 industries with highest factor intensity
30 industries with highest factor intensity

Figure 4.1d

Representation of the most R&D-intensive industries in exports to the EU

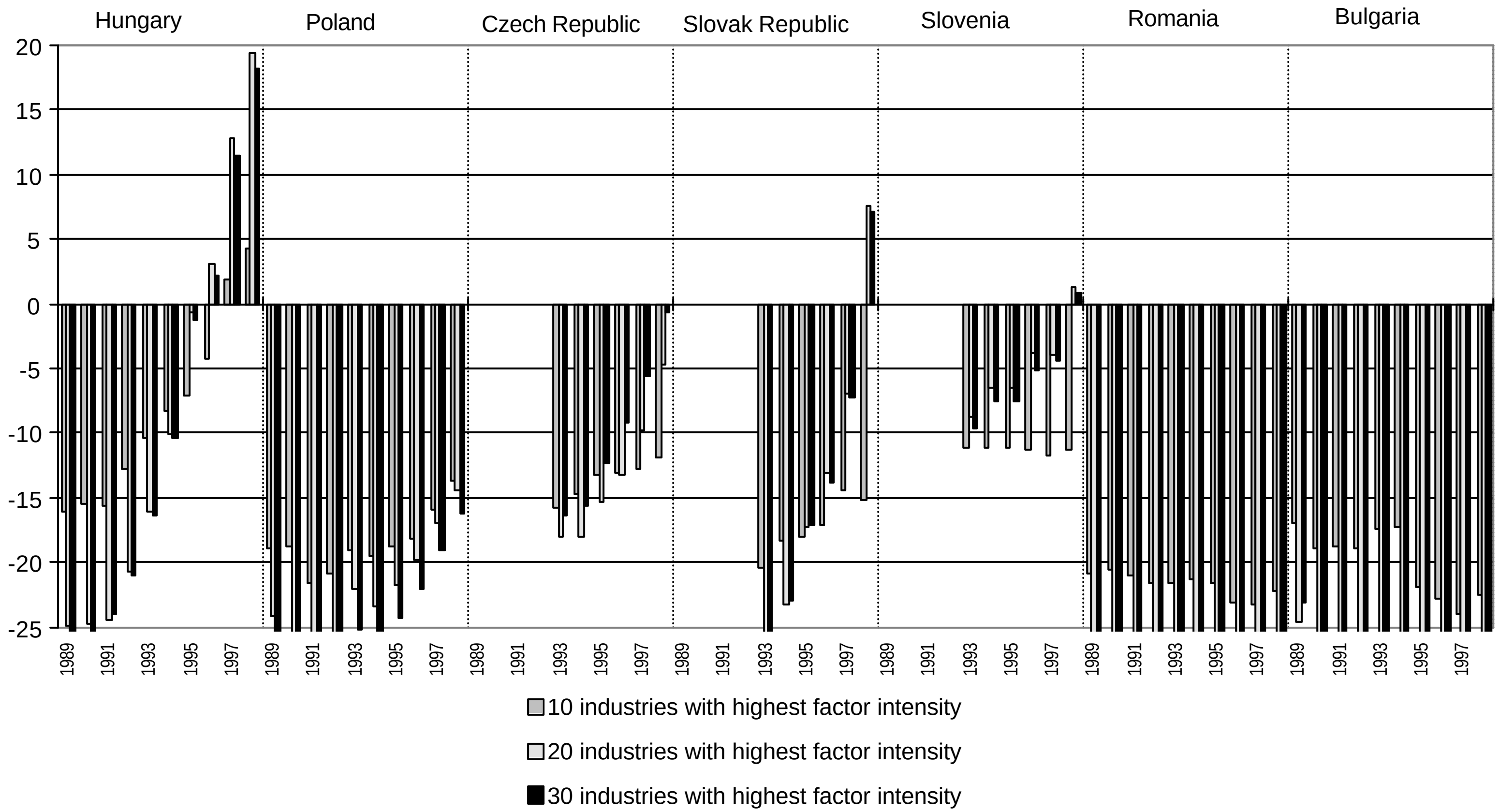


Figure 4.1e

Representation of the most energy-intensive industries in exports to the EU

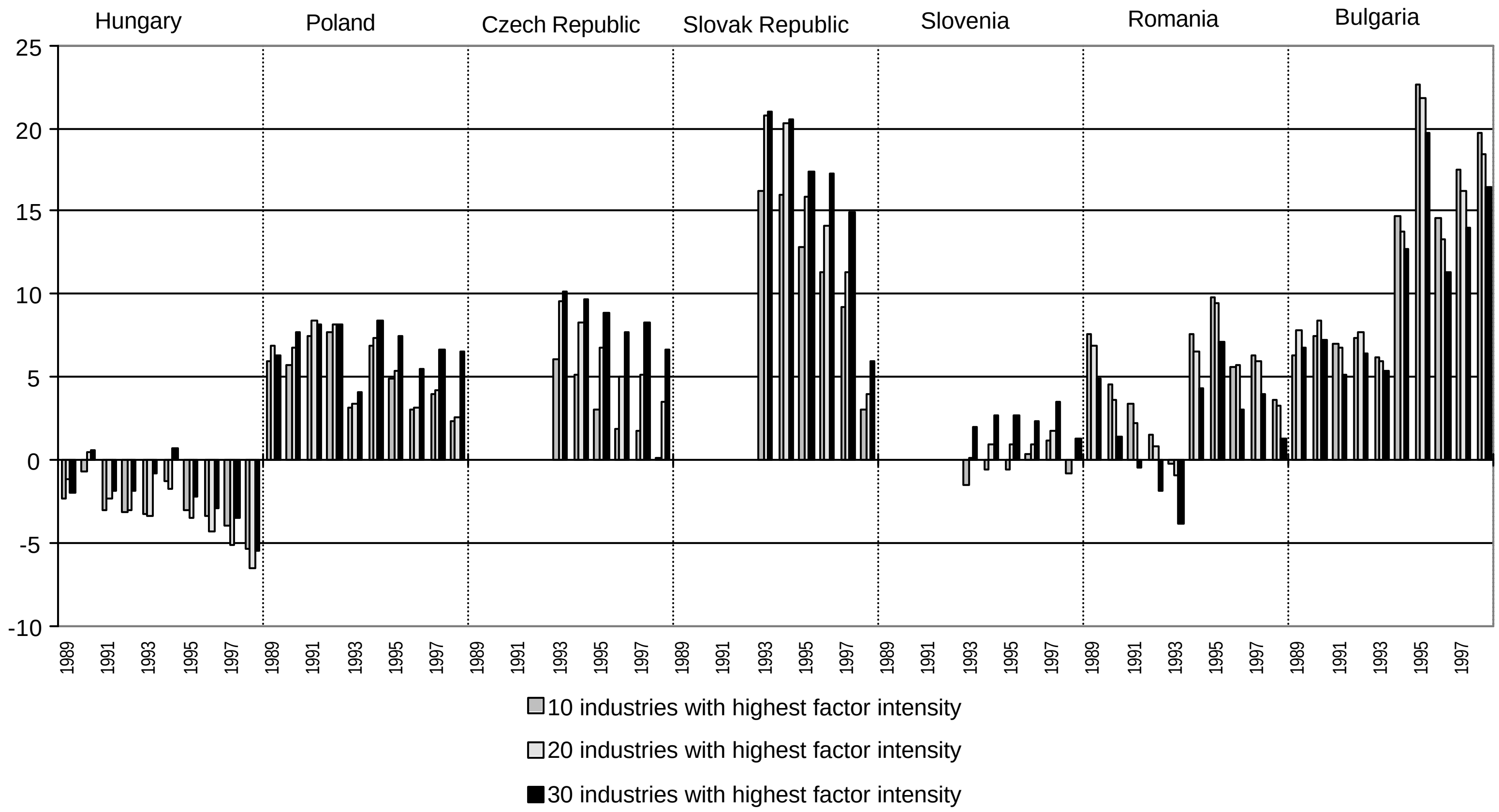


Figure 4.2a

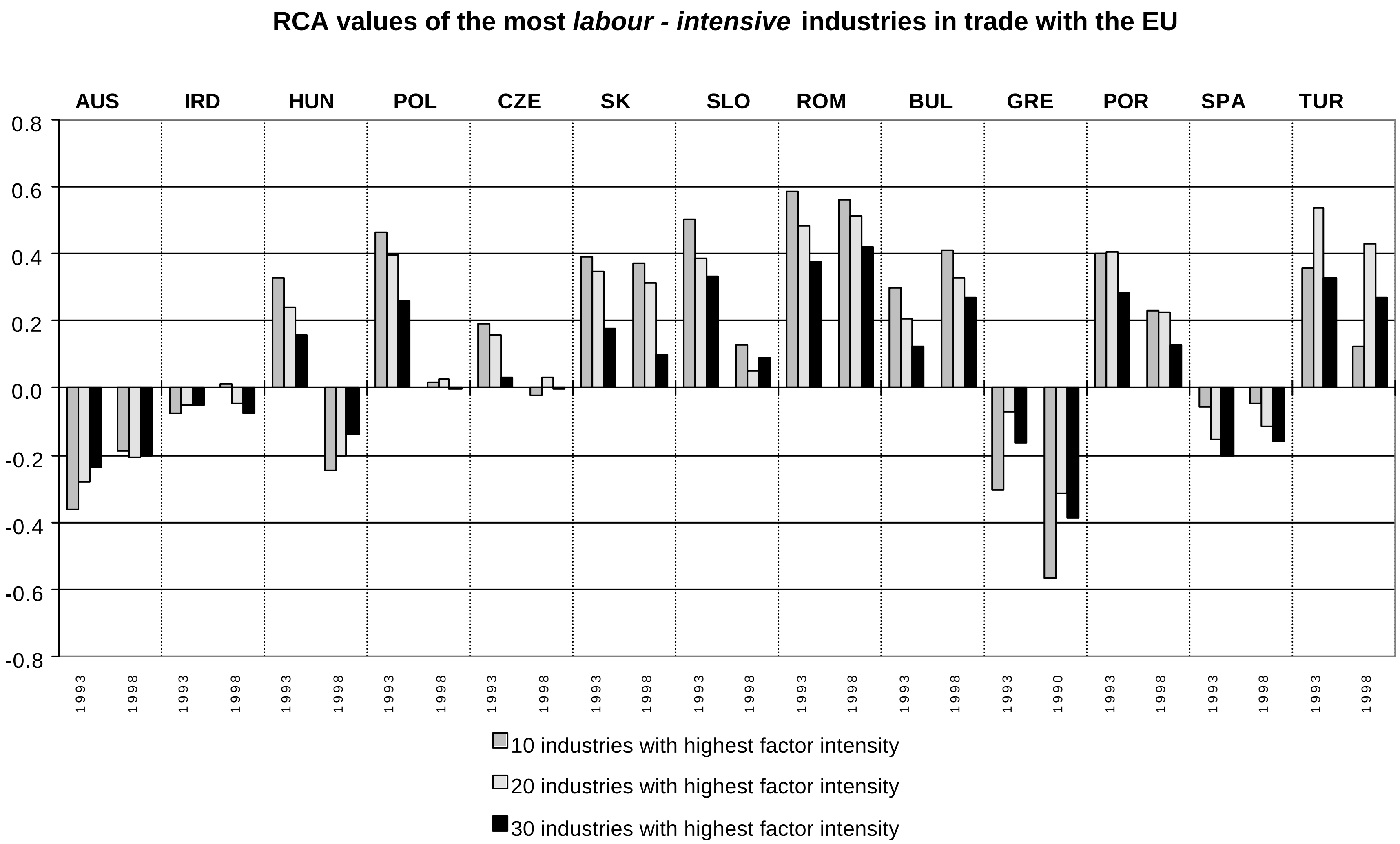

RCA values of the most *labour - intensive* industries in trade with the EU
AUS
IRD
HUN
POL
CZE
SK
SLO
ROM
BUL
GRE
POR
SPA
TUR
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
1993
1998
1993
1998
1993
1998
1993
1998
1993
1998
1993
1998
1993
1998
1993
1998
1993
1998
1993
1990
1993
1998
1993
1998
1993
1998
10 industries with highest factor intensity
20 industries with highest factor intensity
30 industries with highest factor intensity

Figure 4.2b

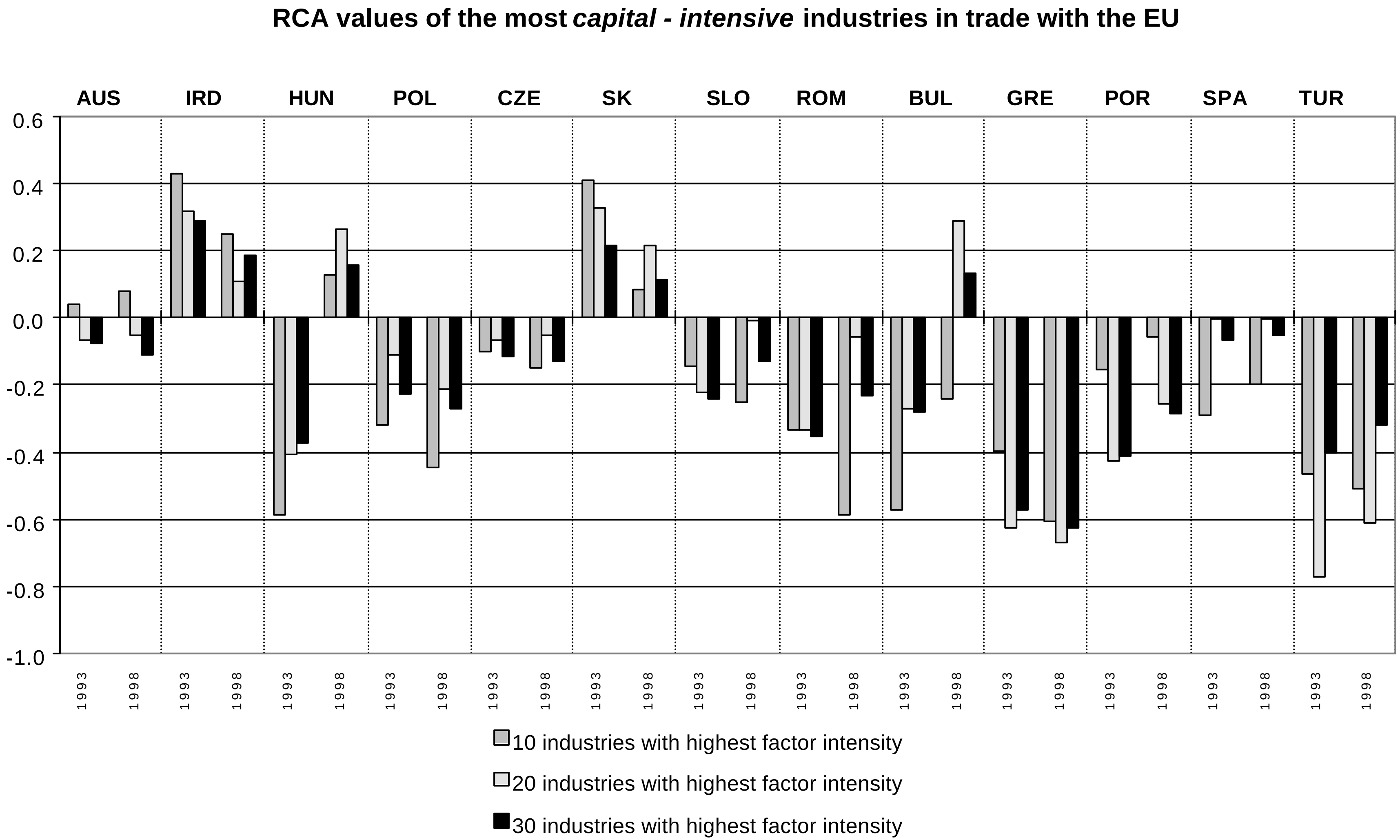

RCA values of the most *capital - intensive* industries in trade with the EU
AUS
IRD
HUN
POL
CZE
SK
SLO
ROM
BUL
GRE
POR
SPA
TUR
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
1993
1998
10 industries with highest factor intensity
20 industries with highest factor intensity
30 industries with highest factor intensity

Figure 4.2c

RCA values of the most *R&D - intensive* industries in trade with the EU

Figure 4.2d

RCA values of the most *skill- intensive* industries in trade with the EU

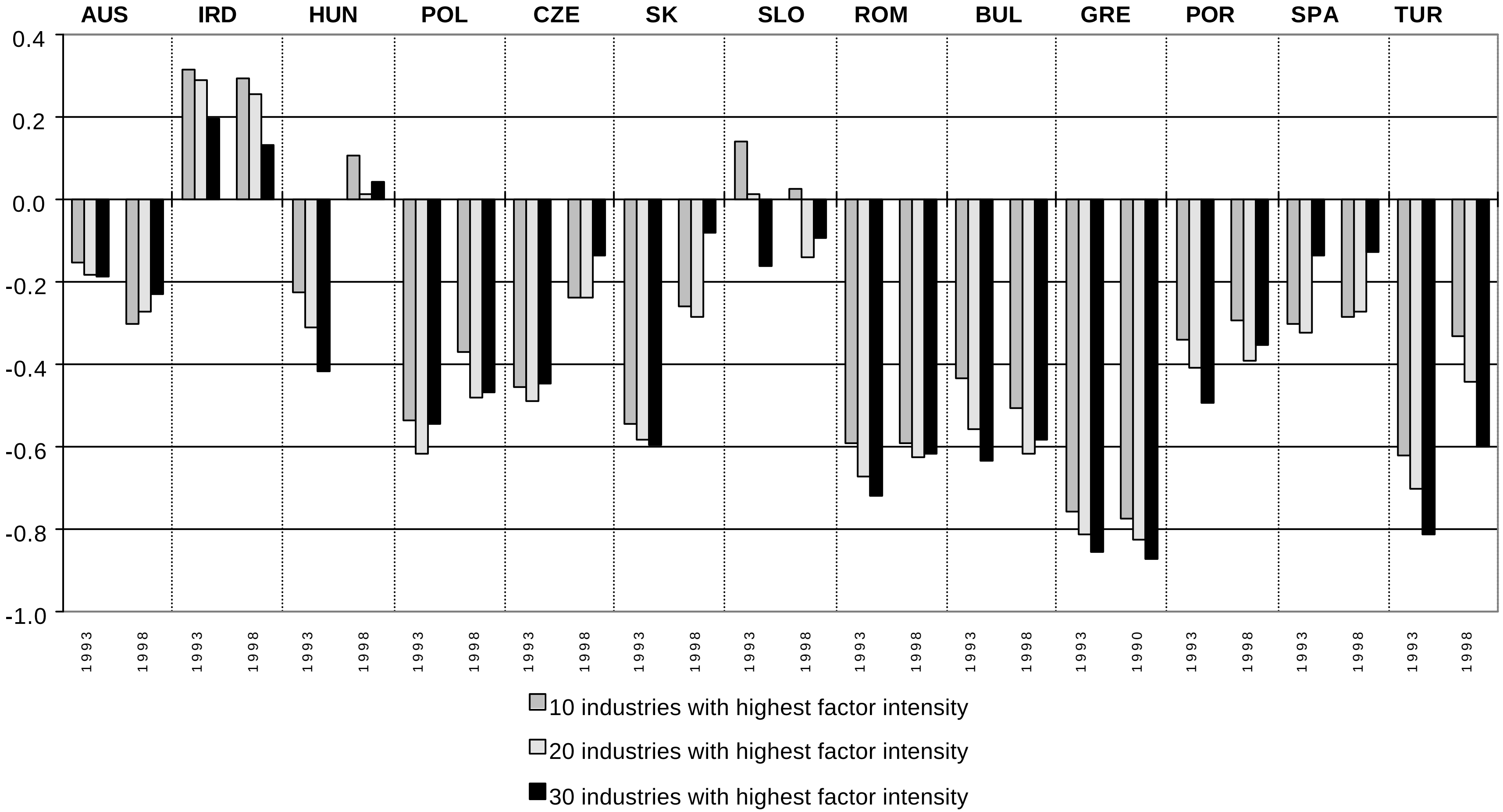
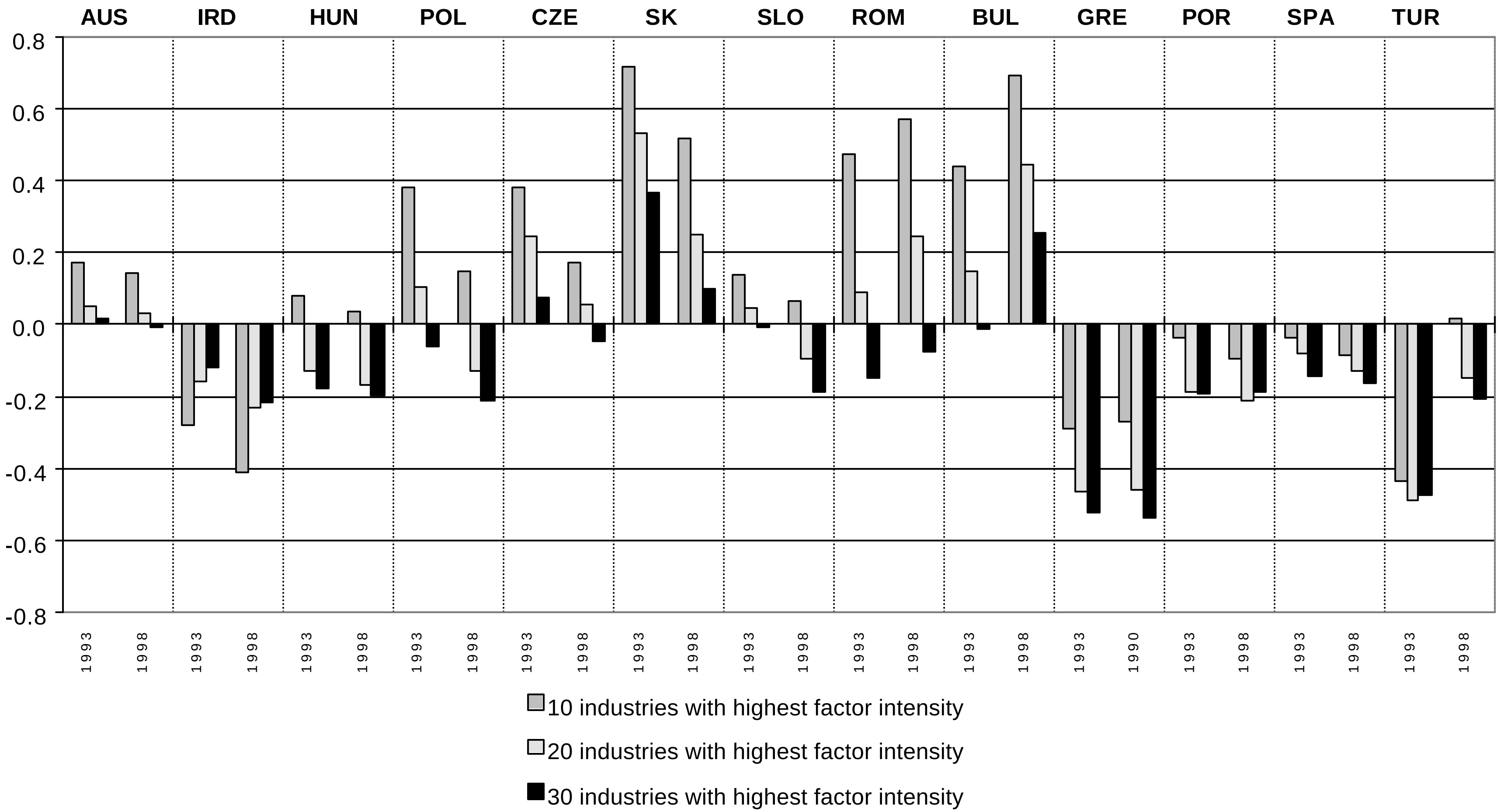


Figure4.2e

RCA values of the most *energy - intensive* industries in trade with the EU



APPENDIX B

Tables

Table 1.1

Gross value added by activities

		shares in % (at current prices)				real growth cumulated rate in %		
		1989	**1993**	**1997**	**1998**	**90-93**	**94-98**	**90-98**
Agriculture and fishing	Czech Republic 1)2)	8.2	5.3	4.7	4.6	-21.7	-6.9	-27.1
	Hungary	15.6	6.6	5.9	5.5	-32.7	4.3	-29.8
	Poland	12.9	7.2	5.6	4.8	-6.6	2.6	-4.2
	Slovak Republic 2)	9.3	5.3	5.1	4.6	-34.5	1.8	-33.3
	Slovenia	4.8	5.1	4.2	3.9	-11.3	3.8	-7.9
	Bulgaria 1)	18.3	10.6	26.6	21.1	-38.3	56.5	-3.5
	Romania	15.7	21.6	19.7	16.1	18.9	-8.4	9.0
Industry and Construction	Czech Republic 1)	47.5	41.1	42.9	43.3	-32.0	21.3	-17.5
	Hungary	42.6	31.6	32.7	32.8	-28.9	36.9	-2.6
	Poland	52.4	42.7	37.5	36.1	-24.0	48.2	12.6
	Slovak Republic 3)	58.5	40.2	35.1	33.3	-32.5	25.4	-15.4
	Slovenia	47.3	38.1	37.4	37.7	-32.2	25.2	-15.2
	Bulgaria 1)	49.9	32.8	28.2	28.7	-37.5	-16.4	-47.8
	Romania	56.4	40.3	44.3	36.3	-33.5	6.3	-29.3
of which: **Manufacturing industry**	Czech Republic 1)3)	.	.	.	.	-40.9	24.8	-26.3
	Hungary	.	21.9	23.9	24.1	.	50.6	.
	Poland	.	27.4	22.5	21.6	.	69.3	.
	Slovak Republic 3)	.	20.6	24.8	.	-51.2	25.0	-39.0
	Slovenia	39.4	29.5	27.6	27.4	-33.8	25.1	-17.2
	Bulgaria 1)	.	.	18.7	19.1	.	.	.
	Romania	44.7	27.5	.	.	-39.9	.	.
Services	Czech Republic 1)	44.4	53.6	52.4	52.1	15.1	4.3	20.1
	Hungary	41.8	61.9	61.4	61.7	-4.4	10.3	5.4
	Poland	34.7	50.0	56.9	59.1	4.2	22.2	27.3
	Slovak Republic	32.2	54.5	59.8	62.1	.	.	.
	Slovenia	47.9	56.8	58.4	58.3	-1.6	21.5	19.5
	Bulgaria 1)	31.8	56.5	45.2	50.2	-37.6	-25.9	-53.7
	Romania	27.9	38.1	36.1	47.6	-10.3	-2.2	-12.3

1) In 1989 data for shares refer to 1990. - 2) Real growth rates refer to gross agricultural output. - 3) Real growth rates refer to gross industrial output.

Source: WIIW Database incorporating national statistics.

Table 4.1

Factor intensities used in trade structure analysis

	NACE 3 Digit	Capital Intensity	Labour Intensity	R&D Intensity	Skill Intensity	Energy Intensity
Iron & steel industry (as def. in ECSC Treaty)	221	7.37	7.29	0.6	33.4	10.47
Manufacture of steel tubes	222	3.16	9.48	0.6	33.4	5.02
Drawing, cold rolling and cold folding of steel	223	5.04	8.85	0.6	33.4	3.26
Production and prel. processing of n-ferr.metals	224	6.64	6.03	0.65	33.4	7.85
Manuf. of clay prod. for constructional purposes	241	6.61	14	0.6	29.5	13.26
Manufacture of cement, lime and plaster	242	12.48	6.24	0.6	29.5	19.4
Manuf.of concrete,cement or plast.prod.f.const.	243	5.2	9.93	0.6	29.5	3.41
Manuf.of art.of asbestos (excl.art.of asb.-cement)	244	3.94	17.78	0.6	29.5	3.16
Working of stone and non-metallic mineral prod.	245	7.5	10.12	0.6	29.5	8.22
Production of grindstones & other abravise prod.	246	2.56	14.01	0.6	29.5	2.09
Manufacture of glass and glassware	247	5.59	12.7	0.6	29.5	7.85
Manufacture of ceramic goods	248	3.12	17.43	0.6	29.5	5.75
Manuf.of paint, painter´s fillings, varnish, print.ink	255	4.13	8.59	4.21	53.2	1.97
Manuf. of oth.chem.prod..mainly f.ind.&agricult.pur.	256	7.71	7.02	4.21	53.2	4.57
Manufacture of pharmaceutical products	257	6.13	7.81	9.48	53.2	1.52
Manuf. of soap, synth. detergents, perfume	258	5.39	6.83	4.21	53.2	1.12
Manuf. of oth. chem. prod. chiefly for household	259	5.93	8.59	4.21	53.2	1.93
Man-made fibres industry	260	8.47	8.15	0.59	41.6	7.57
Foundries	311	3.35	15.14	0.59	28.7	6.48
Forging:drop forging,closed dieforg.,press.&stamp.	312	3.74	12.92	0.59	28.7	4.42
Secondary transformation, treatm.&coating of met.	313	3.42	15.8	0.59	28.7	3.26
Manuf.of structural met.prod.(incl.integr.assembly)	314	2.38	12.29	0.59	28.7	1.24
Boilermaking, manuf.of reserv.,tanks,sheet-met c.	315	2	13.2	0.59	28.7	1.2
Manuf.of tools&finished met.goods(exc.electr.equ)	316	3.44	13.75	0.59	28.7	1.82
Manufacture of agricult. machinery and tractors	321	2.88	10.66	1.18	40.9	1.46
Manufacture of machine-tools for working metal	322	3.61	14.09	1.18	40.9	1.42
Manufacture of textile machinery and accessoires	323	3.94	12.45	1.18	40.9	1.18
Manuf. of mach. for the food, chem.,related ind.	324	2.94	11.75	1.18	40.9	0.92
Manuf.of plant f.mines,iron&steel ind.&foundries	325	2.62	11.2	1.18	40.9	1.2
Manuf.of transmission equipment f. motive power	326	3.99	15.95	1.18	40.9	2.17
Manuf.of oth.mach.&equip.f.use in spec.br.of ind.	327	3.81	11.43	1.18	40.9	1.06
Manufacture of other machinery and equipment	328	3.14	12.38	1.18	40.9	1.7
Manuf. office mach.and data-processing mach.	**330**	8.53	6.59	6.06	75.6	0.68
Manufacture of insulated wires and cables	341	4.4	9.71	6.83	48.4	2.24
Manuf.of electrical mach.(compr.electr.motors,etc)	342	2.56	14.41	14.3	48.4	1.65
Manuf.of electrical apparatus,batteries,accumul.	343	3.83	14.48	6.83	48.4	2.43
Manufacture of telecommunications equipment	344	4	14.2	6.83	48.4	0.94
Manuf.of radio, tv receiving sets, sound reprod,...	345	5.36	10.89	6.83	48.4	1.19
Manufacture of domestic type electric appliances	346	3.83	12.33	6.83	48.4	1.27
Manuf.of electr.lamps & oth.eletr. lighting equip.	347	3.28	14.64	6.83	48.4	1.73
Manuf.& assembly of motor vehicles & mot.v.eng.	351	6.69	7.49	3.43	29.9	1
Manuf.of bodies for motor vehicles	352	2.2	11.78	3.43	29.9	1.1
Manuf. of parts and access. for motor vehicles	353	4.73	12.48	3.43	29.9	1.8
Shipbuilding	361	2.23	17.26	0.76	42.3	2.13
Manuf.of standard and narrow-gauge railway	362	1.91	16.29	1.22	42.3	2.18
Manuf.of cycles, motor-cycles & parts & access.	363	3.05	12.79	1.22	42.3	1.4
Aerospace equipment manufact. and repairing	364	3.64	10.75	14.34	42.3	1.69
Other transport equipment	365	2.09	17.28	1.22	42.3	1.35
Manuf.of measuring, checking & prec.instr.& app.	371	2.33	15.27	3.98	47.6	0.96
Manuf.of medical & surgical equip.& orthop.appl.	372	3.1	17.62	3.98	47.6	1.11
Manuf.of optical instruments & photogr. equip.	373	4.55	16.09	3.98	47.6	0.99
Manufacture of clocks & watches & parts thereof	374	2.32	15.73	3.98	47.6	1.05
Manufacture of vegetable and animal oils and fats	411	8.91	3.02	0.24	37.2	1.9
Slaughtering, preparing and preseving of meat	412	3.76	6.97	0.24	37.2	1.86
Manufacture of dairy products	413	6.07	4.27	0.24	37.2	1.71
Processing and preserving of fruit and vegetables	414	5.88	8.06	0.24	37.2	2.1
Process.&preserv.of fish&oth.sea foods f.hum.con	415	3.47	11.53	0.24	37.2	1.92

(Table 4.1 ctd.)

Table 4.1 ctd.

Factor intensities used in trade structure analysis

Grain milling	416	8.2	3.16	0.24	37.2	1.91
Manufacture of spaghetti, macaroni, etc.	417	9.13	5.03	0.24	37.2	1.99
Manufacture of starch and starch products	418	12.03	4.51	0.24	37.2	4.99
Manuf.of cocoa, chocolate and sugar confect.	421	4.66	8.96	0.04	37.2	1.68
Manuf.of animal and poultry foods (incl.fish meal)	422	7.86	3.62	0.24	37.2	1.74
Manufacture of other food products	423	6.26	5.36	0.24	37.2	1.21
Distilling of ethyl alcohol from fermented materials	424	6.24	4.2	0.24	37.2	1.42
Brewing and malting	427	12.73	6.33	0.24	37.2	2.3
Manuf.of soft drinks,incl.bottling of nat.spa waters	428	9.53	6.88	0.24	37.2	1.71
Knitting industry	436	2.11	16.14	0.14	27.1	1.72
Manuf.of carpets,linoleum and oth.floor coverings	438	3.95	10.53	0.14	27.1	2.94
miscellaneous textile industries	439	3.21	15.65	0.14	27.1	3.23
Tanning and dressing of leather	441	3.21	7.38	0.59	28.7	2.19
Manuf.of prod.from leather & leather substitutes	442	1.42	18.14	0.59	28.7	0.76
Manuf.of mass-prod.footwear (excl.wood,rubber)	451	1.35	18.64	0.14	24.5	0.98
Manuf.of ready-made clothing and accessoires)	453	1.09	20.39	0.14	24.5	0.82
Manuf.of household text.&oth.made-up text.goods	455	2.08	16.44	0.14	24.5	1.49
Manufacture of furs and of fur goods	456	1.27	15.25	0.14	24.5	1.94
Sawing and processing of wood	461	4.2	11.35	0.19	23.5	1.7
Manufacture of semi-finished wood products	462	6.42	9.56	0.19	23.5	3.14
Manuf.of carpentry and joinery components	463	3.1	13.39	0.19	23.5	1.6
Manufacture of wooden containers	464	2.29	16.17	0.19	23.5	1.88
Other wood manufactures (except furniture)	465	3.17	15.68	0.19	23.5	2.66
Manuf.of art.of cork,straw,oth.plainting materials	466	2.51	17.76	0.19	23.5	1.6
Manufacture of wooden furniture	467	2.38	14.13	0.19	23.2	1.55
Manufacture of pulp, paper and board	471	12.43	6.68	0.14	48.8	8.53
Processing of paper and board	472	4.92	10.95	0.14	48.8	2.52
Printing and allied industries	473	4.18	11.68	0.14	48.8	1.48
Manufacture of rubber products	481	3.44	14.34	1.14	33.7	3.9
Retreading and repairing of rubber tyres	482	4.05	15.11	1.14	33.7	4.46
Processing of plastics	483	5.16	11.63	1.14	33.7	2.94
Manuf.of art.of jewellery,gold & silversmith´s ware	491	2.05	10.57	0.59	35.2	1.39
Manufacture of musical instruments	492	1.69	17.69	0.59	35.2	1.31
Photographic, cinematographic laboratories	493	4.06	19.4	0.59	35.2	1.53
Manufacture of toys and sport goods	494	3.02	16.91	0.59	35.2	1.38
Miscellaneous manufacturing industries	495	2.84	17.46	0.59	35.2	1.53

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