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Structural features of economic integration in an Enlarged Europe: patterns of catching-up and industrial specialisation

by

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Structural features of economic integration in an Enlarged Europe: patterns of catching-up and industrial specialisation

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Abstract

This paper discusses the evolution of competitiveness, industrial and trade specialization in the manufacturing sector of the countries of Central and Eastern Europe (CEECs). It is shown that the paths taken by the different CEECs have been quite diverse and we attempt to apply a combination of a catching-up plus trade specialization model which is required to understand the patterns of specialization emerging in Central and Eastern Europe. We start with a theoretical outline of our argument and move on to discuss patterns of productivity and wage catching-up across industries which give rise to interesting movements in comparative cost dynamics. This is complemented with an analysis of patterns of trade specialization, including measures of product quality upgrading. We add information about the industrial allocation of FDI and comparative educational attainment as well as on the evolution of labour demand by skill groups. All the above yields an interesting (and at times unexpected) picture of the evolving division of labour in an Enlarged Europe.

Keywords: structural change, international specialization, catching-up, convergence, Central and Eastern Europe, EU enlargement, international integration and labour markets

JEL classification: F02, F14, F21, L6, O57, P52

Michael Landesmann

Structural features of economic integration in a Enlarged Europe: patterns of catching-up and industrial specialisation[2]

1 Introduction

In this paper we analyse structural developments and the evolution of competitiveness in the countries of Central and Eastern Europe (CEECs). Since the beginning of the transition in 1989 the CEECs have gone through a dramatic process of systemic change and structural adjustment in which their integration into trade and production links with Western Europe has played a major role. This paper describes the processes of structural adjustment which have taken place and we shall take a particular stance with regard to the patterns of production and trade specialization which have emerged in this process of East-West European integration. EU enlargement will of course be a major step in this process towards full integration, but the basic outlines of the division of labour which is emerging in this 'enlarged Europe' have already become visible prior to that.

Underlying our analysis is a theoretical model (see Landesmann and Stehrer, 2000 and Stehrer, 2001) which attempts to combine a model of catching-up with international trade specialization and thus falls into the category of the dynamic modelling of trade and growth (for other approaches, see Krugman, 1986, Grossman and Helpman, 1991, Taylor, 1993). The basic outlines of the model are simple and have been guided by the 'stylized facts' observed in growth patterns of successful and less successful catching-up economies. Such economies start off with substantial productivity (and product quality) gaps and such gaps are not the same across all industrial branches. Typically, the gaps are greater in the technologically more advanced branches and less in the technologically less demanding ones. This has the following implications: full catching-up has a longer way to go in the technologically more advanced branches and this can be interpreted in two ways. On the one hand, it is 'more difficult' to catch up fully in such branches as it requires a much greater effort in learning, skill acquisition and often a big jump in organizational and managerial capacities; on the other hand, it means that the scope for differential productivity growth (and for product quality upgrading) between the 'technology leader' and the catching-up economy ('the laggard') is higher where the initial gap is larger.

This is a simple application of the Gerschenkron hypothesis ('advantage of backwardness') which states that the 'potential' for growth is highest where the 'initial gap' is the highest

[2] A previous version of the paper, 'Evolving Competitiveness of CEEC's in an Enlarged Europe' (written jointly with Robert Stehrer from the Vienna Institute for International Economic Studies (WIIW)), was published in *Rivista di Politica Economica*, No. I-II, January-February 2002, pp. 23-87.

(Gerschenkron, 1962). This principle has, of course, been widely applied at the aggregate level and is the background for the much tested 'convergence' hypothesis in the many recent aggregate growth studies (for a survey of such studies see Temple, 1999). What is special in our model is that we apply this principle at the industrial level with the implication that those industries have the greatest potential for productivity growth and product quality up-grading that start off with the biggest 'initial gaps'. Of course, as pointed out early on by Abramovitz (1986), actual growth is not necessarily equal to potential growth as countries (and in our case industries) might not be able to exploit this potential. Abramovitz emphasized here the importance of 'social capabilities', i.e. a wide range of institutional and behavioural requirements which are necessary such that actual catching-up comes as close as possible to potential catching-up. This analysis opens a wide range of possible catching-up patterns. In the case of our more disaggregated analysis it also means that the *dynamics of comparative advantages* which determines a country's position in the international division of labour can follow quite different patterns for catching-up economies. At a more concise level, the dynamics of specialization advantages and disadvantages is determined by the timing of 'switchovers' in the comparative cost structures across industrial branches. Here the dynamics of relative productivity growth rates and of wage rates across industrial branches plays a decisive role. We have examined these patterns of comparative advantages across the historical experiences of a wide range of catching-up economies in a number of analytical and empirical studies (see Landesmann and Stehrer, 2001, and Stehrer and Wörz, 2001) and will show in this paper that the approach gets also validated in the analysis of patterns of catching-up and trade specialization of CEECs after the transition.

In an extension of this approach, it is possible to show that the allocation of *foreign direct investment (FDI)* across industrial branches is similarly affected by the dynamics of comparative advantages although in this context we also emphasize the role which price-cost margins (Schumpeterian profits) play in determining (particularly foreign) investment activity[3]. In the present paper we shall also show that – similarly to the uneven productivity dynamics mentioned above – *product quality up-grading* also proceeds at different speeds across industrial branches and this also represents another important aspect of catching-up. Just as the model implies that the range of experiences with respect to catching-up patterns and hence of the positions that economies occupy in the international division of labour can be quite wide, this is borne out by the diversity of experiences we observe in Central and Eastern Europe.

We shall now give an overview of the structure of the paper: Section 2 summarizes gives an theoretical outline of the growth and trade specialisation framework we use in the

[3] Foreign direct investment – through technology transfers – in turn affects the dynamics of catching-up and hence the dynamics of trade specialization. See Landesmann and Stehrer, 2002, for an attempt to extend our theoretical model by endogenizing foreign direct investment flows and its impact.

interpretation of the ongoing catching-up processes. Section 3 takes a closer look at structural change within the manufacturing sector and reveals at this level some of the interesting emerging patterns of industrial specialization of CEECs. Section 4 reports on the main determinants of industrial cost competitiveness, i.e. productivity, wage rates and labour unit costs and shows in which industry groupings (lower-tech, resource-based, higher-tech) the strongest inroads were made in relative productivity and unit cost developments. Section 5 discusses trade performance und uses various classifications guided by industrial organization and skill content criteria to show the qualitative pattern of trade specialization emerging in CEECs in relation to the European Union (EU). We also discuss in some detail the patterns of product quality up-grading mentioned above. A simple regression analysis completes the section. Section 6 gives some evidence on FDI allocation across industrial branches and section 7 looks at the educational attainment in the CEECs and at labour market developments in CEECs in particular in relation to the positions of different skill groups. The argument here is that the positions of skill groups reflect the patterns of catching-up and industrial specialization discussed in the previous sections of the paper. The concluding section provides an outlook on the impact which EU enlargement will have on the further integration processes between Central and Eastern and Western Europe.

2 Catching-up patterns with 'weak' and 'strong' Gerschenkron effects

In the following we shall adopt a very simple, stylised version of the model developed in Landesmann and Stehrer (2000, 2002) as well as Stehrer (2002). We formulate, first, a simple process of catching-up in productivity levels - in the form of a differential equation - at the level of an individual industry *i* between a 'catching-up economy' *c* and a productivity leader *L*.

$$\dot{a}^{c}_{li,z} = \gamma_{i,z}(a^{c}_{li,z} - a^{L}_{li,z})$$

where $a^{c}_{li,z}$ refers to the (inverse of the) level of labour productivity in industry *i* in country *c* and $a^{L}_{li,z}$ to that in the lead economy *L* (where *z* refers to different skill groupings, e.g. *z=u,s*, where *u* stands for skilled and unskilled labour respectively).[4] On the left-hand side, we have the rate of change of the former variable. This simple formulation allows us to differentiate between a 'weak' and a 'strong' Gerschenkron effect, named after the author of the famous concept of the 'advantage of backwardness' (see, Gerschenkron, 1962). Take two industries at a point in time and assume that the productivity growth rates of both

[4] More complicated functional forms could be adopted such as a logistic pattern of catching-up (see Landesmann and Stehrer, 2000).

these two industries in the lead country are the same. We can then distinguish two cases which lead to differential productivity growth (and hence of catching-up) in the two industries in the catching-up economy:

First, assume that the convergence parameter takes on the same value in both industries. In this case, differences in the rates of productivity growth arise simply because the gaps in productivity levels to the leader, i.e. the terms $(a^c_{li,z} - a^L_{li,z})$, differ between the two industries. In fact, we shall observe higher productivity growth in the industry with the higher contemporaneous gap. We call this the 'weak' Gerschenkron effect. This effect drives 'convergence' in the recent growth theoretical literature which, however, is mainly concerned with the aggregate level. In our case we look at the Gerschenkron effect at the disaggregated, industrial level which has - as we shall see - important implications for the dynamics of comparative advantage.

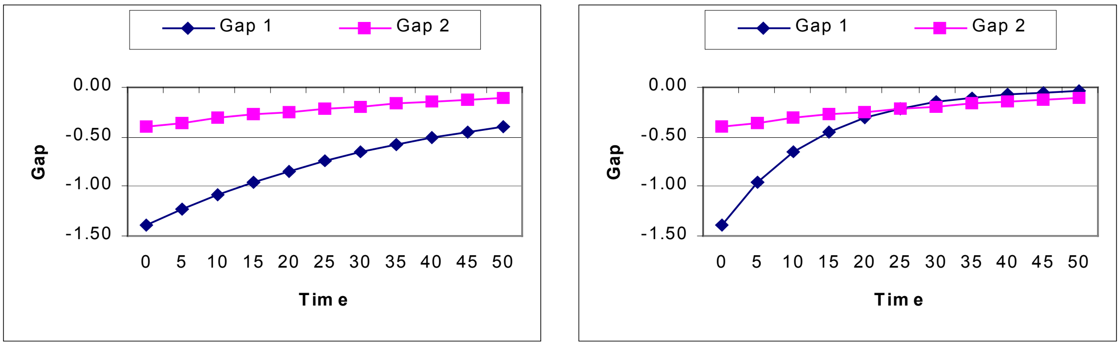
In the second case, we allow the convergence parameters to differ between the two industries. In the case where this parameter - which we can call the catching-up or learning parameter - is higher in the industry with the higher productivity gap, we shall speak of the 'strong' Gerschenkron effect.

Figure 2.1 shows the two hypothetical situations in which productivity gaps in the two industries have been plotted. Panel a) depicts the case where both industries are characterised by the same convergence parameter; in Panel b) we show the case where the industry with the higher initial gap is also characterised by a higher convergence parameter (reasons for this will become clear below). In a Ricardian interpretation the second pattern gives rise to a '*switchover in comparative advantage'*, i.e. a situation in which the relative productivity position of the catching-up economy turns in favour of the industry in which the initial relative productivity gap was higher.

There are three further ingredients to our stylised 'structural model' of catching-up:

One refers to the behaviour of wages, the other to the emergence of 'transitory rents', and the third to the impact which differential rents have upon the attractiveness of different industrial sectors to investors (particularly foreign investors) which in turn contributes towards a fast speed of 'learning' and technology transfer. Let us deal with these in turn.
The dynamics of relative wage costs: Given the specification of relative productivity catching-up discussed above, we now have to add the behaviour of industry wages in order to analyse the dynamics of relative (labour) unit cost dynamics across sectors. Labour unit costs of sector *i* amount to $a^c_{li,z} w^c_{li,z}$ where $w^c_{li,z}$ refers to the wage rate paid in sector *i* in country *c*. Wage rates are driven by three factors: by bargaining over 'transitory rents' which are industry-specific (see below) and by economy-wide conditions with respect

to the rate of unemployment and by a long-run tendency of wage rates to equalise across sectors for the same skill group.



Panel a) Panel b)

Figure 2.1

$$\dot{w}^{c}_{i,z} = f\left(\underset{+}{s^{c}_{i}}, \underset{-}{u^{c}_{z}}, \underset{-}{w^{c}_{i,z} - \bar{w}^{c}_{z}}\right)$$

where the s^c_i refers to transitory rents arising in sector *i*, u^c_z to the (economy-wide) rates of unemployment for skill group *z*, and $\bar{w}^c_{i,z}$ to the average wage rate of skill group *z* in the economy as a whole.

By definition relative (labour) unit costs will fall in a sector where relative productivity growth exceeds relative wage growth. As there are two economy-wide terms in the wage equation, the above formulation implies that sectors with relatively fast productivity growth will experience somewhat faster wage growth compared to other sectors (because of the emergence of transitory rents which affect industry-specific wage growth), but relative wage growth will be less than relative productivity growth (because of the impact of the economy-wide terms). Hence relative unit (labour) costs in this sector will fall. As productivity growth is furthermore specified in relation to an international productivity leader (see above), this relative unit cost dynamics also implies a shift in comparative cost dynamics in favour of this sector.

Next we come to the emergence of 'transitory rents'. Without going into the micro-foundations of price-setting, we simply postulate that prices do not adjust immediately to unit costs plus a (long-run) mark-up. As a result *transitory rents* s^c_i arise unevenly in different sectors as a function of the speed of relative unit cost movements, and the speed of price-to-cost adjustment.

$$s_i^c = p_i^c - (1+\pi)c_i^c$$

Finally, we relate the attractiveness of different sectors to investment activity in general and FDI in particular to the emergence of relative rents. The relative investment rates (and particularly relative FDI involvement) in different sectors affect, in turn, the speed of 'learning' (or of 'technology transfer') in different sectors. This provides a powerful mechanism of 'endogenising' relative catching-up rates of different sectors and hence supports the possibility of a 'strong Gerschenkron' effect.

$$\dot{a}_{li,z}^{c} = \gamma_{i,z}(FDI_i^c)(a_{li,z}^c - a_{li,z}^L)$$

Overall the model maps out the following scenario: Uneven rates of catching-up (starting with the 'weak' Gerschenkron effect) give rise to uneven rates of productivity growth across sectors. Given the sector- and economy-wide factors of wage rate determination, there will be uneven unit-cost movements such that relative unit costs fall in sectors with the higher initial gaps. In addition, with delayed price to cost adjustment, there will be the emergence of transitory rents in those sectors with the strongest relative productivity performance. This in turn affects the relative attractiveness of different sectors to investment activity in general and to FDI in particular. It provides a mechanism to endogenise the 'speed of technology transfer' and hence shifts comparative cost dynamics and rent dynamics further in favour of industries in which initial productivity gaps were particularly high. In Landesmann and Stehrer (2000) we gave empirical evidence supporting this type of emergence of 'comparative advantage switchovers' in successful catching-up economies.

The dynamics of comparative advantages described by this model has, of course, implications for the demand for different skill groups of workers in both the 'lead' and the 'catching-up' economies. We can show in our model analysis (see Landesmann and Stehrer, 2000, and Stehrer, 2002) that the aggregate demand for different skill groups is a function of four factors:

- the skill composition of labour demand in the different sectors which are defined by the labour input coefficients for different skill types (level effect);

- changes in the skill composition which result, on the one hand, from 'skill biases' in the processes of technological change as well as from substitution effects due to relative wage changes (across skill groups);

- rates of (non-skill specific) rates of productivity growth (or catching-up) in different sectors;

- the evolution of output levels of different sectors (driven by competitiveness and domestic and international demand structures).

The last factor is endogenised in our model through the evolution of demand (for details see Landesmann and Stehrer, 2002) and we can thus focus on the other three factors. It will be a plausible assumption that the gaps in productivity levels get reflected also in gaps of skill composition. Hence, in the Gerschenkronian fashion, a large overall gap in productivity levels also implies a large gap in skill compositions and thus in the rate of (skill biased) technological change. Consequently the rates at which the relative demand for skilled labour changes in different sectors in the catching-up economy will be a function of the initial gaps. A catching-up process with technological convergence will thus imply automatically a skill-biased nature of technological catching-up. On the other hand, the relative wage (substitution) effect could go in the other direction as higher rents in the more skill-intensive sector lead to an increased skill-premium.

The skill-biased nature of a catching-up process (with output composition effects and intra-industry skill composition effects) thus indicates that a - successful (i.e. Gerschenkronian) - catching-up economy will experience increased relative demand for skilled labour. This could be counteracted either by very fast rates of (skill neutral) technical progress in the sector which uses skilled labour more intensively and/or by strong substitution effects induced by large (transitory or permanent) skill-premia. The latter are, of course, also a function of the supplies of skilled vs. unskilled labour.

The model has, by endogenising the dynamics of the relative labour demands for skilled and unskilled labour in the course of a catching-up process (as well as the relative slack variables on the labour markets), also all the ingredients to study the 'pull' and 'push' factors of international migration.

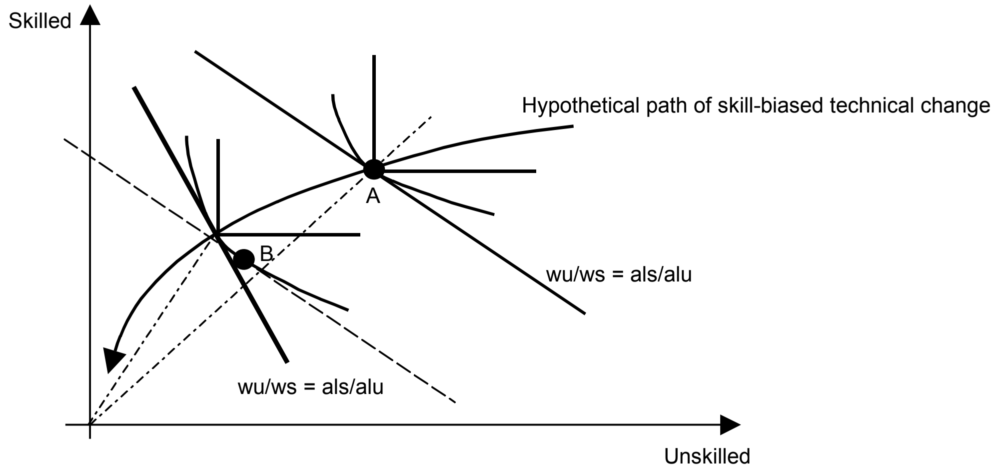


Figure 2.2 Path of technical change

3 Convergence and divergence in manufacturing structure

Let us now look more closely at the ongoing structural change within the manufacturing sector in the CEECs. We use data from The Vienna Institute for International Economic Studies (WIIW) industrial database, which reports several variables at the NACE rev. 1, 2-digit level (DA-DN) for seven Central and Eastern European countries. In this paper we restrict the analysis to the period 1993-2000, i.e. after the transformational crises. The data, which are mostly collected from national sources, are likely at times to be inconsistent over the years (e.g. as data sources changed or for methodological reasons, such as coverage of the small enterprise sector). To overcome these problems we tested the series for significant changes in the growth rates to check when a structural break was indicated by using dummies in the estimates on growth rates. If this procedure indicated a significant break the data series was adjusted accordingly.

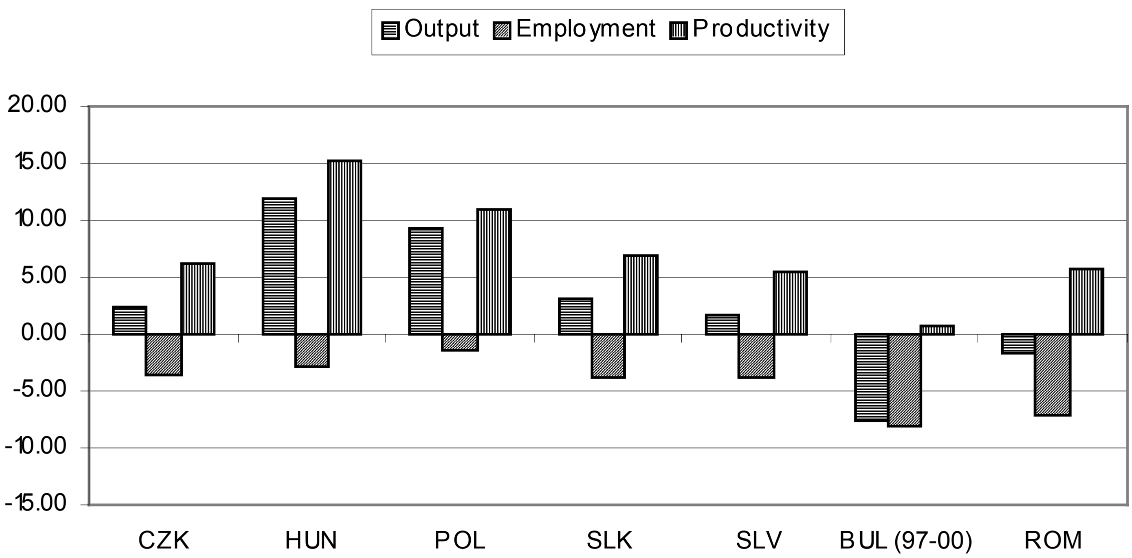
Let us first get an overview of growth processes in aggregate manufacturing over the period 1993-2000, i.e. after the immediate impact of the 'transformational recession'. Figure 3.1 shows the trend (per annum) growth rates of output, employment and labour productivity. We can see that trend employment growth over this period in manufacturing was negative in all of the transition countries. It ranged from –8.1 and –7.1% in Bulgaria and Romania to –1.4% in Poland. Output growth was even more diverse, with negative growth over that period in Bulgaria and Romania and a wide spectrum of growth rates amongst the 'more advanced' of the candidate countries. The relatively high growth rates in manufacturing output in Hungary (11.9) and Poland (9.4) are particularly striking with rather modest trend growth in the other three economies. (Labour) productivity growth results directly from the difference in output and employment growth and shows again a quite wide range of diversity, with Hungary and Poland again the forerunners driven by high output growth, followed by a range of economies with per annum average growth rates in labour productivity of 5-7%. It is clear from these figures that the relationship between output and employment growth is quite differentiated across the transition countries and, most likely (as would be seen if the time series were analysed more closely) unstable across time, reflecting major periods of restructuring and other periods when labour hoarding takes place in the wake of output declines.

We now move on to present a qualitative picture of the ongoing structural changes within manufacturing. For this purpose we do not report developments in all the 14 industries contained in the database but aggregated the industries into three broader categories (note that these do not cover all manufacturing industries):

- *low-tech, labour-intensive industries:* food products, beverages and tobacco (DA), textiles and textile products (DB), and leather and leather products (DC)
- *resource-intensive industries*: wood and wood products (DD), coke, refined petroleum products and nuclear fuel (DF), chemicals, chemical products and man-made fibres

Figure 3.1

Growth rates of employment, output, and productivity (1993-2000)



Source: WIIW industrial database; own calculations.

- (DG), and other non-metallic mineral products (DI)

medium- to high-tech industries: machinery and equipment (DK), electrical and optical equipment (DL), and transport equipment (DM)

Table 3.1a reports data on employment and output shares (both at prices 1996 and at current prices) and the wage structure for the seven Central and Eastern European countries and Austria as the benchmark.[5] Further Table 3.1b shows deviations of the variables from Austria in percentage points.

One can see that all countries started in 1993 with high shares in low-tech industries relative to Austria. In employment Hungary and Poland with more than about 20 and 16 percentage points above Austrian shares were the countries with the highest shares in low-tech industries. The lowest deviation from Austria can be observed for the Czech Republic. This corresponds to the data on output shares (either at current or constant 1996 prices). With regard to employment shares in medium-/high-tech industries only the Czech Republic and Slovakia showed initially higher employment shares than Austria, reflecting a strong position of the engineering sector in these two economies. In terms of output shares, the medium-/high-tech sectors had in all countries lower output shares than the benchmark Austria (although for some countries these deviations were quite small). In the resource-intensive sectors the shares relative to Austria are smallest on average both in terms of employment and output shares.[6]

More interesting than these starting values are, however, the trends over time. Employment shares in low-tech sectors have been declining slightly in the Czech Republic, Hungary, Poland, Slovakia and Slovenia but have increased dramatically in Bulgaria (from about 30% to about 43%) and in Romania. On the other hand one can see slight increases of employment shares in the medium-/high-tech sectors in the Czech Republic and very large increases in Hungary (from 23% to 32%). Relative to Austria all countries except the Czech Republic and Hungary now show lower employment shares in medium-/high-tech sectors than in 1993. For the resource-intensive sectors there are no clear trends across countries and changes are small.

These trends in employment shares can either result from changes in output or changes in (labour) productivity (ignoring possible interactions between these two variables). Compared to Austria the output shares of low-tech industries at constant 1996 prices have fallen dramatically in the Czech Republic, Hungary, Poland and Slovakia and remained almost stable for Slovenia. On the other hand the shares of these industries compared to Austria have risen in Bulgaria and Romania from nine to about 16%.[7] This shows a clear pattern of specialization amongst the CEECs. Regarding the medium-/high-tech sectors one can see the opposite tendencies for output measured at constant prices. Hungary increased its share dramatically from about 17% to more than 55%, the Czech Republic from 25% to 36%, and Slovakia from 18% to about 33%. In the other countries output

5 An average of EU economies would have been preferable for this comparison, but Austria was singled out as a benchmark country for reasons of data availability.

6 One reason for this pattern is the relatively large share of resource-intensive industries in Austria.

7 It is however interesting to see that the output shares of the low-tech industries at current prices have fallen in all countries (most strongly again in Hungary and the Czech Republic), the difference to the constant price output shares being driven by changes in relative prices.

shares of high-tech industries also increased, but at lower rates and remained more or less stable in Bulgaria. The rising share of high-tech output in Romania is due to the decreasing share of resource-intensive industries (especially chemicals and chemical products (DG)). Output shares of high-tech industries at current prices were rising in all countries except for Bulgaria and Romania. Again a clear and diverse pattern of industrial specialization gets revealed.

Table 3.1a

Changes in the structure of manufacturing – 1993 and 2000

	Employment shares			Output (at prices 1996)			Output structure (at current prices)		Wage structure	
	1993	**2000**	**Employment growth (p.a.)**	**1993**	**2000**	**Output growth (p.a)**	**1993**	**2000**	**1993**	**2000**
Austria[1]										
Low-tech	19.64	18.21	-2.39	20.51	17.08	2.36	21.59	16.91	84.57	79.35
Resource-intensive	17.00	16.17	-1.79	23.66	20.72	3.00	23.30	21.74	103.01	104.86
Medium-high-tech	29.22	30.66	-0.17	27.08	34.05	9.23	26.74	33.08	108.48	112.32
Czech Republic[2]										
Low-tech	24.65	22.69	-4.80	27.07	19.94	-0.81	28.31	22.39	88.54	83.20
Resource-intensive	14.22	17.16	-1.72	20.60	18.00	1.97	18.59	18.60	105.63	113.70
Medium-high-tech	31.53	33.05	-3.28	25.60	36.35	7.76	26.37	30.16	99.46	106.84
Hungary										
Low-tech	39.20	36.95	-3.91	34.73	16.64	1.83	34.66	19.17	85.44	77.15
Resource-intensive	16.55	15.27	-4.11	27.58	11.28	-0.73	25.95	17.18	124.54	133.67
Medium-high-tech	22.67	32.01	1.32	16.70	56.80	24.40	18.61	46.76	101.93	111.51
Poland[2]										
Low-tech	35.56	33.08	-2.59	34.86	27.49	5.61	35.91	30.53	88.55	81.92
Resource-intensive	15.63	16.82	-0.54	21.76	19.56	7.31	22.80	20.07	106.47	110.55
Medium-high-tech	26.22	22.70	-3.51	19.22	24.40	12.10	18.64	23.09	105.16	113.94
Slovakia										
Low-tech	27.52	26.85	-0.03	26.38	17.83	-0.78	25.22	18.52	85.59	85.60
Resource-intensive	17.08	16.18	-1.27	24.27	20.87	2.94	25.26	19.61	111.33	103.71
Medium-high-tech	31.70	28.62	-1.68	18.10	32.90	9.99	18.46	27.29	95.74	105.39
Slovenia[2]										
Low-tech	29.21	26.08	-3.83	27.10	23.67	0.11	26.78	23.65	95.44	86.41
Resource-intensive	14.29	15.40	-0.89	18.90	19.63	1.76	20.09	18.35	110.85	113.48
Medium-high-tech	26.84	25.88	-2.69	25.29	29.61	4.30	25.51	28.94	97.20	101.06
Bulgaria										
Low-tech	29.22	43.28	-3.73	29.82	31.37	-4.15	32.67	29.60	97.38	81.21
Resource-intensive	13.46	14.22	-8.61	25.58	31.72	-2.26	25.25	36.66	128.30	135.91
Medium-high-tech	29.21	22.31	-13.33	14.59	13.58	-6.82	17.82	12.39	105.94	102.52
Romania										
Low-tech	32.05	37.90	-4.80	29.54	33.71	0.09	33.77	29.95	86.96	76.62
Resource-intensive	15.60	15.49	-7.54	28.76	23.11	-5.06	24.49	26.72	110.97	114.15
Medium-high-tech	28.92	24.66	-9.63	14.42	18.77	1.65	19.79	14.75	103.96	127.10

Notes: 1) 1999 instead of 2000 for output at prices 1996 and current output. - 2) 1999 instead of 2000 for current output

Table 3.1b

Changes in the structure of manufacturing (Austria = 100) – 1993 and 2000

	Employment			Output (at prices 1996)			Output structure (at current prices)		Wage structure	
	1993	**2000**	**Employment growth (p.a.)**	**1993**	**2000**	**Output growth (p.a)**	**1993**	**2000**	**1993**	**2000**
Czech Republic[2)]										
Low-tech	5.01	4.48	-2.42	6.56	2.86	-3.17	6.72	5.48	3.97	3.86
Resource-intensive	-2.78	0.99	0.07	-3.06	-2.72	-1.04	-4.71	-3.13	2.62	8.83
Medium-high-tech	2.31	2.39	-3.12	-1.47	2.30	-1.47	-0.37	-2.92	-9.03	-5.48
Hungary										
Low-tech	19.56	18.74	-1.52	14.22	-0.43	-0.53	13.07	2.26	0.87	-2.19
Resource-intensive	-0.46	-0.90	-2.32	3.93	-9.44	-3.73	2.65	-4.56	21.53	28.81
Medium-high-tech	-6.54	1.35	1.49	-10.38	22.75	15.17	-8.13	13.68	-6.55	-0.81
Poland[2)]										
Low-tech	15.92	14.87	-0.21	14.35	10.41	3.25	14.32	13.62	3.98	2.57
Resource-intensive	-1.37	0.65	1.25	-1.89	-1.16	4.30	-0.50	-1.66	3.46	5.68
Medium-high-tech	-3.00	-7.96	-3.34	-7.86	-9.65	2.87	-8.10	-9.99	-3.33	1.62
Slovakia										
Low-tech	7.87	8.63	2.35	5.87	0.75	-3.14	3.63	1.61	1.02	6.25
Resource-intensive	0.08	0.01	0.53	0.62	0.15	-0.06	1.96	-2.13	8.32	-1.15
Medium-high-tech	2.48	-2.04	-1.52	-8.98	-1.16	0.76	-8.28	-5.79	-12.74	-6.93
Slovenia[2)]										
Low-tech	9.57	7.86	-1.45	6.58	6.59	-2.25	5.19	6.75	10.86	7.06
Resource-intensive	-2.71	-0.77	0.90	-4.76	-1.09	-1.25	-3.21	-3.38	7.84	8.62
Medium-high-tech	-2.38	-4.78	-2.52	-1.78	-4.45	-4.93	-1.23	-4.14	-11.29	-11.26
Bulgaria										
Low-tech	9.58	25.07	-1.34	9.31	14.29	-6.52	11.08	12.70	12.81	1.86
Resource-intensive	-3.54	-1.95	-6.82	1.92	11.00	-5.26	1.95	14.92	25.29	31.05
Medium-high-tech	-0.01	-8.36	-13.16	-12.49	-20.47	-16.05	-8.92	-20.69	-2.54	-9.80
Romania										
Low-tech	12.40	19.69	-2.41	9.03	16.64	-2.27	12.18	13.04	2.39	-2.73
Resource-intensive	-1.40	-0.68	-5.75	5.10	2.39	-8.06	1.19	4.98	7.96	9.29
Medium-high-tech	-0.30	-6.00	-9.46	-12.65	-15.28	-7.58	-6.96	-18.33	-4.53	14.78

Notes: 1) 1999 instead of 2000 for output at prices 1996 and current output. - 2) 1999 instead of 2000 for current output

With respect to the wage structure one would expect that on average wage rates are relatively higher in the higher-tech sectors (e.g. by the assumption that the skill intensity is higher for these sectors or the higher productivity of these sectors). However, the general picture in 1993 was that average wages have been highest in all countries in the resource-intensive sectors and lowest in the low-tech sectors. Comparing this with the year 2000 we can indeed see a catching-up of relative wage rates in the medium-/high-tech branches and a falling-behind in the low-tech branches. The question for comparative costs is whether such changes proceed above or below relative productivity level adjustments which will be explored in the next section of the paper. One can also find a trend towards a convergence of wage structures (e.g. compared to the Austrian as a representative of a Western European wage structure) although this process seems to be slow.

Note that the analysis of output and employment patterns already points towards our initial (Gerschenkron) hypothesis that specialization patterns of catching-up economies may get directed towards the medium-/higher-tech branches (as was the case especially in Hungary) where initially the gap might have been the largest. This requires the fastest catching-up in areas in which the initial gaps are the highest and this in turn depends on the existence (or mobilization) and utilization of 'capabilities' (to use Abramovitz' terms) to facilitate such differential catching-up. This was apparently not the case in Bulgaria and Romania and the experience in this respect was also quite differentiated amongst the other (more advanced) candidate countries. We now turn to the productivity and cost side of production in order to look at the development of productivity gaps and the evolution of comparative cost structures more directly. After that we study the emerging patterns of trade specialization.

4 Productivity, wage rates and unit labour costs

Not only productivity matters for competitiveness but also wage rates play their role in shaping relative cost structures and hence the competitive position of different industries from the cost side. In Table 4.1 we have summarized the data again for the three types of industries (low-tech, resource-intensive, and medium-/high-tech).

Using the same database as before, we focus now on productivity, wage rates and unit labour costs. For productivity levels we use employment and data on output which are first expressed in national currency units (NCU) at prices 1996. For comparative analysis these can be converted either by using nominal exchange rates (EXR) or PPP rates (PPP) for the year 1996.[8] Output for industry i in country c in year t is denoted as . Data on wages

[8] For this analysis we are constrained to using PPP rates for GDP as a whole. For selective countries we have been able to obtain industry-level unit value ratios to adjust for industry level differences in price levels, but this database is not large enough to allow the more extensive comparative analysis presented here.

and salaries are first obtained in NCU at nominal values. These data are converted into a common currency (euro) using either current EXR or current PPP.[9] Data on employees refer to average employment levels over the years.

Labour productivity is calculated as $LPR_{i,t}^{c} = PR_{i,t}^{c} / E_{i,t}^{c}$. Further, unit labour costs are defined as $ULC_{i,t}^{c} = LPR_{i,t}^{c} / \left(W_{i,t}^{c} / E_{i,t}^{c}\right)$. In Tables 4.1 wage rates, productivity levels and unit labour costs are compared to Austria (= 100). The variables for Austria have been calculated analogously. Table 4.1a presents the data using the nominal exchange rates (EXR) conversion and in Table 4.1b the gaps are derived from PPP comparisons (both wage rates and productivity levels). The difference between the two tables thus reflects the development of the ratio between the exchange rate and the PPP rate. In the following we shall discuss first the three variables expressed at exchange rates.

4.1 Productivity

Expressed in nominal exchange rates all countries showed a large gap in 1993. The best performing country was Slovenia, reaching a productivity level of about 27% (relative to Austria). Bulgaria and Romania only reached a productivity level of about 5% to 6% of the Austrian level.
There are however differences when looking at industry groups. In all countries the gaps to Austria were the largest in the medium-/high-tech industries and smallest in the low-tech industries, the measured difference in the productivity gaps between these two sets of industries was generally between 5 and 10 percentage points.

Over time rapid changes in these patterns occurred. All countries experienced positive productivity growth from 1993 to 2000 (see Figure 3.1 earlier in the paper). But not all countries succeeded in closing the gap relative to the benchmark Austria. In aggregate manufacturing only the Czech Republic, Hungary, and Poland had higher productivity growth than Austria. All other countries had lower productivity growth and thus the gap widened.

[9] One might ask why one should look at wage rates also in PPP terms as one is interested in comparative actual wage costs. The reason could be that one might want to conjecture what wage costs would be when price levels between the CEECs and the EU have converged. One could see such a comparison as an exercise multinationals might be interested in if they want to judge relative wage cost differentials also for the longer run when the severe undervaluation of the CEECs' national currencies would get eroded. In this case, workers would still ask at least for the same real wage rate as they now obtain, an estimate for which would be the wage rate at PPP rates.

Table 4.1a

Productivity, wage and unit labour cost gaps at EXR – 1993 and 2000, (AUT=100)

		Wage			Productivity			Unit labour costs		
		1993	**Growth rate**	**2000**	**1993**	**Growth rate**	**2000**	**1993**	**Growth rate**	**2000**
Czech Republic	Manufacturing total	7.79	-8.72	13.14	13.70	-1.05	14.58	48.10	-3.63	59.80
	Low-tech	8.49	-8.79	14.60	16.52	1.32	16.39	47.39	-4.77	58.90
	Resource-intensive	7.00	-9.31	12.39	15.49	-4.03	16.56	58.54	0.20	55.35
	Medium-high-tech	7.36	-9.58	12.85	11.90	-2.37	13.88	50.45	-5.45	68.65
Hungary	Manufacturing total	11.22	0.64	10.80	17.91	-8.01	28.96	62.19	10.68	32.77
	Low-tech	12.01	-0.07	12.00	17.34	-1.93	19.35	77.75	7.10	53.80
	Resource-intensive	11.54	0.05	11.58	16.48	2.60	13.66	113.90	3.27	82.35
	Medium-high-tech	10.73	0.11	10.51	14.07	-15.04	48.40	66.66	14.77	22.36
Poland	Manufacturing total	7.94	-8.67	13.36	15.31	-3.45	18.84	51.67	-4.12	66.15
	Low-tech	8.42	-9.12	14.72	15.97	-2.74	19.02	57.26	-4.11	71.18
	Resource-intensive	7.89	-9.03	13.64	14.05	-1.64	16.02	58.36	-6.14	82.88
	Medium-high-tech	7.88	-9.19	13.76	11.71	-6.34	17.23	69.00	-2.02	75.34
Slovak Republic	Manufacturing total	6.71	-6.02	9.63	15.15	3.19	12.52	50.77	-2.51	59.04
	Low-tech	7.12	-8.34	12.02	17.86	6.74	12.21	57.02	-6.67	82.42
	Resource-intensive	6.18	-5.52	8.50	12.05	-0.40	11.57	63.28	-2.52	73.31
	Medium-high-tech	5.98	-7.14	9.79	9.28	-2.05	19.39	72.14	-0.04	58.30
Slovenia	Manufacturing total	21.65	-5.74	30.54	27.13	2.64	23.16	87.53	-1.71	97.00
	Low-tech	27.46	-5.26	38.64	34.76	3.01	30.03	105.55	-1.09	104.70
	Resource-intensive	23.92	-5.27	34.59	33.32	4.86	29.82	80.35	-6.01	104.12
	Medium-high-tech	19.63	-5.96	27.93	29.25	0.80	27.16	75.57	-0.22	83.73
Bulgaria	Manufacturing total	4.24	0.66	4.08	6.61	5.18	4.84	80.17	3.60	64.58
	Low-tech	5.57	2.82	4.63	7.65	6.17	5.28	90.53	4.89	71.85
	Resource-intensive	5.06	1.90	4.43	7.28	4.84	4.61	111.54	3.62	89.04
	Medium-high-tech	4.31	1.80	3.74	3.55	2.85	3.23	125.74	3.69	93.27
Romania	Manufacturing total	2.93	-2.32	3.36	5.25	0.95	4.96	52.06	0.26	51.27
	Low-tech	3.26	-2.20	3.74	7.08	-2.34	8.66	49.55	-0.14	49.42
	Resource-intensive	2.77	-2.85	3.23	5.97	5.16	3.95	60.20	0.75	57.13
	Medium-high-tech	2.88	-3.46	3.55	2.70	-3.81	3.71	87.14	-1.55	86.13

Table 4.1b

Productivity, wage and unit labour cost gaps at PPP – 1993 and 1999

		Wage			Productivity			Unit labour costs		
		Gap 1993	Growth rate	Gap 1999	Gap 1993	Growth rate	Gap 1999	Gap 1993	Growth rate	Gap 1999
Czech Republic	Manufacturing total	28.91	-3.16	34.94	40.80	-1.05	43.44	48.10	-3.63	59.80
	Low-tech	31.53	-3.23	38.82	49.21	1.32	48.82	47.39	-4.77	58.90
	Resource-intensive	25.99	-3.76	32.96	46.14	-4.03	49.33	58.54	0.20	55.35
	Medium-high-tech	27.32	-4.02	34.18	35.45	-2.37	41.35	50.45	-5.45	68.65
Hungary	Manufacturing total	28.28	0.58	27.32	48.32	-8.01	78.12	62.19	10.68	32.77
	Low-tech	30.28	-0.14	30.36	46.78	-1.93	52.21	77.75	7.10	53.80
	Resource-intensive	29.10	-0.01	29.31	44.46	2.60	36.85	113.90	3.27	82.35
	Medium-high-tech	27.05	0.04	26.60	37.94	-15.04	130.56	66.66	14.77	22.36
Poland	Manufacturing total	22.61	-5.44	31.34	38.81	-3.45	47.74	51.67	-4.12	66.15
	Low-tech	23.99	-5.89	34.55	40.47	-2.74	48.20	57.26	-4.11	71.18
	Resource-intensive	22.47	-5.79	32.02	35.61	-1.64	40.59	58.36	-6.14	82.88
	Medium-high-tech	22.44	-5.95	32.30	29.67	-6.34	43.65	69.00	-2.02	75.34
Slovak Republic	Manufacturing total	24.22	-3.61	30.08	48.85	3.19	40.35	50.77	-2.51	59.04
	Low-tech	25.69	-5.93	37.55	57.57	6.74	39.37	57.02	-6.67	82.42
	Resource-intensive	22.29	-3.11	26.56	38.83	-0.40	37.30	63.28	-2.52	73.31
	Medium-high-tech	21.59	-4.73	30.57	29.91	-2.05	62.49	72.14	-0.04	58.30
Slovenia	Manufacturing total	43.39	-2.49	50.40	48.51	2.64	41.41	87.53	-1.71	97.00
	Low-tech	55.03	-2.02	63.76	62.14	3.01	53.69	105.55	-1.09	104.70
	Resource-intensive	47.94	-2.03	57.07	59.57	4.86	53.31	80.35	-6.01	104.12
	Medium-high-tech	39.34	-2.72	46.08	52.30	0.80	48.55	75.57	-0.22	83.73
Bulgaria	Manufacturing total	7.19	-12.19	14.94	30.92	5.18	22.66	80.17	3.60	64.58
	Low-tech	9.44	-10.02	16.96	35.78	6.17	24.73	90.53	4.89	71.85
	Resource-intensive	8.57	-10.94	16.22	34.09	4.84	21.59	111.54	3.62	89.04
	Medium-high-tech	7.30	-11.04	13.70	16.59	2.85	15.13	125.74	3.69	93.27
Romania	Manufacturing total	15.67	1.94	13.95	28.54	0.95	26.96	52.06	0.26	51.27
	Low-tech	17.48	2.06	15.50	38.52	-2.34	47.10	49.55	-0.14	49.42
	Resource-intensive	14.85	1.41	13.40	32.47	5.16	21.47	60.20	0.75	57.13
	Medium-high-tech	15.44	0.80	14.70	14.67	-3.81	20.21	87.14	-1.55	86.13

But here again there are marked differences across types of industries. Hungary closed the gap in the high-tech industries with a (per annum) rate of closure of the gap of 15% and reached a level of about 50% that of Austria. Similarly Poland closed the gap most rapidly in the high-tech sector with a rate of 6% and the Slovak Republic of 2%. Slovenia and Bulgaria were falling back relative to Austria in all three sectors, but the gap widened more (at a higher rate) in the low-tech and resource-intensive industries than in the medium-/high-tech industries. Finally, also Romania succeeded in closing the gap in the low- and the medium-/high-tech industries but started from an extremely low level.

Thus information on productivity catching-up seems to confirm in most instances the Gerschenkron hypothesis at the industrial level, i.e. that faster rates of catching-up can be achieved in industries in which the initial gaps were higher.

4.2 Wage rates

With respect to wage rates one can observe the following pattern. First, the gaps in wage rates are much more even across sectors than was the case with productivity. The gaps in wage rates (at current nominal exchange rates) extended from Slovenia with a level of about 20% the Austrian wage rate level in 1993 to Romania with only 3%. Second, and this is a very important point for the comparative cost dynamic, the growth (or closure) rates for wage rates were much more similar across sectors than was the case for the (differential) productivity growth rates.

4.3 Unit labour costs

The relative movements of wage rates and productivity determine the evolution of unit labour costs which is, of course, an important measure of the general (cost) competitiveness of countries but more importantly, for our purposes, of the relative competitiveness of different industries.

Looking at the dynamics, we can see that in aggregate manufacturing the wage versus productivity growth was such that over the period 1993-2000 unit labour costs were rising (relative to Austria) in the Czech Republic, Poland, Slovak Republic, and Slovenia. They were falling quite strongly in Hungary and Bulgaria, but for quite different reasons as a comparison of productivity and wage rate movements at both current and PPP exchange rates shows. In Hungary this was due to a very strong performance in relative productivity growth and very moderate relative wage growth (at current exchange rates), while in Bulgaria there was actually a fall in the productivity position (relative to Austria) but combined with a much sharper fall in relative wage levels (again measured at the current exchange rate and this was due to a sharp devaluation of the Bulgarian currency).

Differences in the dynamics across industry groupings are remarkable especially for those sectors in which countries experienced large productivity growth rates (as wage growth is rather similar across sectors). Especially Hungary reduced relative unit labour costs in the medium-/high-tech sectors from 66% (the Austrian level) in 1993 to about 22% in 2000.

The important point which emerges from cross-industry comparisons is that for some countries the productivity catching-up (closure of the gap) is rather rapid in the medium-/high-tech industries in which the initial gaps were the highest. We reiterate the important point that this pattern very much confirms the 'Gerschenkron hypothesis' as applied to the industry level (and as stated in the introduction of the paper). For other countries no such differential productivity catch-up can be observed; in the language of Abramovitz, such countries either did not have the 'capabilities' or did not mobilize these to make use of the high learning (and technology transfer) potential in those industries in which the initial technological gaps were the highest. On the other hand, we observe that the pattern of wage catching-up (or wage growth) is much more even – than productivity growth – across sectors, and hence comparative cost structures move in favour of those sectors which experience faster productivity catching-up; in Hungary and to a lesser degree also in a number of other CEECs these are the medium- to high-tech sectors. This is exactly the pattern which was also found in research on the dynamics of comparative costs across a much wider range of catching-up economies (see Landesmann and Stehrer, 2001). Let us now move on to examine whether these underlying patterns of comparative cost dynamics get also revealed in the evolving trade structures of CEE economies.

4.4 Convergence

Finally we report a regression analysis on productivity catching up where we applied the concept of β-convergence at the industrial level. Pooling all industries (i.e. the ten industries classified above) and all ten countries (i.e. including the Baltics as well) we estimated the following catching-up equation:

$$g_i^c = \beta GAP_i^c + d_i + d^g + \varepsilon_i^c$$

In this regression we allowed further for country groups d^g and industry-specific effects d_i. Table 4.2 reports the results for the whole sample (including all ten countries).

```
. regress  b1OPR_P96 zOPR_P96 Disic* CONgrcountry*, noconstant

      Source |       SS       df       MS              Number of obs =      98
-------------+------------------------------           F( 13,    85) =    3.57
       Model |  .188692096    13  .014514777           Prob > F      =  0.0002
    Residual |  .345881822    85  .004069198           R-squared     =  0.3530
-------------+------------------------------           Adj R-squared =  0.2540
       Total |  .534573918    98  .005454836           Root MSE      =  .06379

------------------------------------------------------------------------------
   b1OPR_P96 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    zOPR_P96 |  -.0687067   .0224082    -3.07   0.003    -.1132601   -.0241533
      Disic1 |   .0982395   .0363834     2.70   0.008     .0258994    .1705795
      Disic2 |   .0664158   .0305031     2.18   0.032     .0057674    .1270642
      Disic3 |   .0471318   .0305312     1.54   0.126    -.0135724    .1078361
      Disic4 |   .0317248   .0324748     0.98   0.331    -.0328439    .0962934
      Disic5 |  (dropped)
      Disic6 |    .081131   .0364152     2.23   0.029     .0087279    .1535341
      Disic7 |    .134375   .0309983     4.33   0.000     .0727421    .1960079
      Disic8 |   .0560277   .0305422     1.83   0.070    -.0046984    .1167538
      Disic9 |   .0814637   .0309747     2.63   0.010     .0198776    .1430498
     Disic10 |   .1159352   .0305831     3.79   0.000     .0551278    .1767425
CONgrcount~1 |  -.1419235   .0385771    -3.68   0.000    -.2186251   -.0652219
CONgrcount~2 |  -.2044525   .0498906    -4.10   0.000    -.3036484   -.1052567
CONgrcount~3 |  -.1680301   .0481057    -3.49   0.001    -.2636771   -.0723832
------------------------------------------------------------------------------
```

As one can see, we find significant convergence for the whole sample at a rather high rate; the implied half time ($\ln 0.5/\beta$) is about 10 years. For the Gerschenkron hypothesis we must however distinguish industry specific slope coefficients. Thus we estimated the following equation:

$$g_i^c = \alpha + \sum_{j=1}^{3} \beta_j GAP_{i(i \in J)} + d_i + d^g + \varepsilon_i^c$$

i.e. we allowed for different slope coefficients for the three industry groups. Results are presented in table 4.2.

```
. regress  b1OPR_P96 SL* Disic* CONgrcountry*, noconstant

      Source |       SS       df       MS              Number of obs =      98
-------------+------------------------------           F( 15,    83) =    3.37
       Model |  .202445941    15  .013496396           Prob > F      =  0.0002
    Residual |  .332127978    83  .004001542           R-squared     =  0.3787
-------------+------------------------------           Adj R-squared =  0.2664
       Total |  .534573918    98  .005454836           Root MSE      =  .06326

------------------------------------------------------------------------------
   b1OPR_P96 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         SL1 |  -.1087758   .0439558    -2.47   0.015    -.1962022   -.0213494
         SL2 |  -.0914839   .0305957    -2.99   0.004    -.1523375   -.0306303
         SL3 |  -.0348324   .0293562    -1.19   0.239    -.0932207    .0235558
      Disic1 |   .0624363   .0439097     1.42   0.159    -.0248984    .1497709
      Disic2 |  (dropped)
      Disic3 |  -.0187841    .028295    -0.66   0.509    -.0750618    .0374936
      Disic4 |  -.0002992   .0737872    -0.00   0.997     -.147059    .1464607
      Disic5 |  -.0425962   .0798289    -0.53   0.595    -.2013728    .1161803
      Disic6 |   .0578315   .0710727     0.81   0.418    -.0835292    .1991922
      Disic7 |   .0969896   .0763051     1.27   0.207    -.0547782    .2487574
      Disic8 |   .0987443   .0753943     1.31   0.194    -.0512118    .2487004
```

```
      Disic9 |   .1199187   .0740596     1.62   0.109    -.0273829    .2672203
     Disic10 |   .1581106    .075216     2.10   0.039     .0085089    .3077122
CONGrcount~1 |  -.1346069   .0651799    -2.07   0.042    -.2642471   -.0049668
CONGrcount~2 |  -.1984602   .0742099    -2.67   0.009    -.3460607   -.0508598
CONGrcount~3 |  -.1610032   .0716574    -2.25   0.027    -.3035268   -.0184796
------------------------------------------------------------------------------
```

Here we find significant convergence for the low tech and resource intensive industries, however, no convergence for the medium-high tech industries. Further industry specific effects are no longer significant; only industry 10 (DM) shows a significantly different pattern.

```
. regress  b1OPR_P96 SL* Disic10 CONGrcountry*, noconstant

      Source |       SS       df       MS              Number of obs =      98
-------------+------------------------------           F(  7,    91) =    2.47
       Model |  .085264887     7  .012180698           Prob > F      =  0.0230
    Residual |  .449309031    91  .004937462           R-squared     =  0.1595
-------------+------------------------------           Adj R-squared =  0.0948
       Total |  .534573918    98  .005454836           Root MSE      =  .07027

------------------------------------------------------------------------------
   b1OPR_P96 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         SL1 |  -.0477993   .0195007    -2.45   0.016     -.086535   -.0090636
         SL2 |  -.0450848   .0194884    -2.31   0.023    -.0837962   -.0063734
         SL3 |  -.0455003    .018325    -2.48   0.015    -.0819006      -.0091
     Disic10 |   .0536898   .0269958     1.99   0.050     .0000659    .1073137
CONGrcount~1 |  -.0526114   .0205443    -2.56   0.012    -.0934202   -.0118026
CONGrcount~2 |  -.1030518   .0312477    -3.30   0.001    -.1651215   -.0409821
CONGrcount~3 |  -.0647837   .0281432    -2.30   0.024    -.1206867   -.0088808
------------------------------------------------------------------------------
```

In this regression the slope coefficients are significant and imply a half-time of about 15 years. This result confirms our weak Gerschenkron hypothesis. On the other hand, the coefficients are rather similar, which implies that we cannot find a strong Gerschenkron effect for the whole sample. This does not however mean that the strong Gerschenkron effect does not take place in specific industries and specific countries. Indeed, having a closer look at the data reveals that especially industry DM performs rather strongly in Hungary, Poland, Lithuania and the Czech Republic.

Thus we conclude that although the strong Gerschenkron effect is not a general phenomen in the CEEC's; specific industries (especially DM) in specific countries are however following this pattern.

5 Trade performance and trade specialization

In this section we start with an overview of broad sectoral patterns of trade performance and then move towards a more detailed qualitative examination of trade specialization. As will be seen below, the analysis of evolving patterns of trade specialization will turn out to be consistent with the previous observations regarding the dynamics of differentiated productivity catching-up (across countries and industries) and the implications drawn from this regarding comparative cost dynamics. To complete the analysis of trade performance we shall show that indicators of product quality up-grading (measured by the closure of export price gaps) also support the picture drawn here regarding the evolution of comparative advantage dynamics across the different CEE economies.

5.2 Trade specialization in manufacturing

In order to analyse structures and tendencies of trade specialization of CEECs within manufacturing we use the COMEXT database which collects all trade with the EU countries as reporting countries. The database includes data at a very detailed (8-digit) level. The very detailed level will be used in section 5.3 when examining relative export prices as indicators for relative product quality. In this section we shall examine trade structures at the level of industry groupings which themselves are constructed as aggregates of industries defined at the 3-digit NACE level. The industry groupings used are the same ones which were defined for the series of *European Competitiveness Reports* (see European Commission, 1999 and 2000) and the *WIIW Competitiveness study* (WIIW, 2001).

Earlier studies (see e.g. Landesmann, 2000) have shown that the Central and East European countries' trading structure with the EU(12) started in 1989 with a profile typical of less developed economies: the representation of exports of the labour-intensive industrial branches was above-average (in relation to EU imports as a whole), in the capital-, R&D- and skill-intensive branches below-average (particularly in the latter two), while the representation of exports of energy-intensive branches was above-average – which reflected the heritage of cheap energy supplies within the CMEA. Over time, important changes took place in the CEECs' export structure to the EU and in the revealed comparative advantage indicators (*RCAs*) in the different categories of industries. The most remarkable change took place in Hungary: from sizeable deficits in its export structure in the areas of capital-, R&D- and skill-intensive industries, these deficits either eroded completely or turned into surpluses. This pattern was followed in a much less spectacular manner by the Czech Republic and Poland, where deficits in the representation of skill-, R&D- and capital-intensive branches were also reduced. For these economies and also for the Slovak Republic the relatively strong presence of energy-intensive branches declined substantially, while this was not the case with Romanian and Bulgarian exports to the EU (particularly in the latter case, dependence upon energy-intensive exports to the EU increased markedly until 1998). Also the picture with respect to labour-intensive industries was remarkably different in the cases of Romania and Bulgaria, on the one hand, and the CEEC-5 on the other: in the first two, labour-intensive branches became the predominant segment of their exports to the EU, while the dependence upon labour-intensive branches got somewhat reduced in the other countries.

Discontinuity in statistics does not allow us to present a full analysis of patterns of trade specialization going back to 1989 and we focus instead on the period 1995 to 2000 (from 1995 onwards 15 EU reporting countries are represented in the COMEXT database and consistent CN-NACE classification converters can be used). As mentioned above we shall employ for this analysis a qualitative grouping of industries (derived from an aggregation of 3-digit NACE industries) which was being used in the EU Competitiveness Reports and has hence the advantage of immediate comparability with the analysis conducted there for the EU member countries. Two 'taxonomies' are applied: one based on the use of cluster-analytic techniques where industries are clustered (and industry groupings identified) by the use of a number of industrial organization and input use criteria (*taxonomy 1*). This led to the distinction of five industry groupings: mainstream, labour-intensive, capital-intensive, marketing-driven and technology-driven. In the other taxonomy (*taxonomy 2*) industries are grouped by skill intensity (low-skill, medium-skill / blue-collar, medium-skill / white-collar, high-skill). The correspondence between NACE 3-digit industries and the two taxonomies can be seen in Appendix Table A.1 and more detail on the underlying methodology can be obtained from Peneder (2001).

In Table 5.2 we have calculated (in Table 5.2a for taxonomy 1 and in Table 5.2b for taxonomy 2) the percentage points by which certain industry groupings are more or less represented in the export structures of the CEECs compared to the export structure of the EU Northern countries (all EU countries except for Spain, Portugal and Greece). The figures for the EU Southern cohesion countries have been similarly calculated as differences in the percentage representation of their exports to the EU in the different industry groupings relative to that of the EU-North. Finally for the EU Northern countries the actual percentage representation of the industry groupings in their total (intra-EU) exports are presented. In Figure 5.2 we have picked out the shares in countries' exports to the EU of those industry groupings where the qualitatively most striking differences can be observed: the labour-intensive and technology-driven groupings of taxonomy 1 and the low-skill and the high-skill groupings of taxonomy 2.

We can see the following:

– In general there is still a relatively stronger representation of the labour-intensive branches in the CEECs export structures to the EU (compared to the EU Northern countries' export structures). For Poland, Bulgaria, Romania and the Baltic states this dependence is very strong – in fact much stronger than for the EU-South, and for Bulgaria, Romania, Latvia and Lithuania this dependence has, furthermore, sharply increased over the period 1995 to 2000. For the other countries, this 'over-representation' of labour-intensive branches – relatively to the advanced EU member countries – has declined, for some quite sharply. For Hungary a (branch) specialization in this direction no longer exists.

- With respect to technology-intensive branches, which accounted for about 33% of EU Northern EU exports, the CEECs started off in 1995 (earlier figures would indicate that this was even more the case before that) with sizable 'deficits' in these areas. Over the period 1995 to 2000 these deficits have declined substantially in Hungary, the Czech and Slovak Republics, Estonia (in fact, in Hungary and Estonia they have turned into surpluses), and in Poland more mildly. In Bulgaria, Romania, Latvia and Lithuania these deficits have remained at very high levels and in most cases have further increased.
- The picture is similar if we look at the two extreme categories of *taxonomy 2*, i.e. the relative representation of low-skill- and high-skill-intensive industries respectively in the countries' export structures to the EU. Again we can see that the CEECs all started off with an over-representation of the low-skill-intensive branches in their exports to the EU (just as the Southern EU countries did). This overrepresentation fell quite dramatically in the case of a number of CEECs (the Czech and Slovak Republics, Hungary, Poland, Slovenia and Estonia), but again remains at a very high level in Bulgaria, Romania and Lithuania.
- In the high-skill industries, deficits remain in all CEECs (as they do in the Southern EU countries) but the picture shows again quite a bit of differentiation across the CEECs, so that the percentage differences (to EU-North) are below 10% in the case of the Czech and Slovak Republics, Hungary and Slovenia.

Thus the picture which emerges is of strong differentiation across the CEECs by a number of indicators of revealed comparative advantage (see also the WIIW Competitiveness Report, WIIW, 2001, for further indicators and analysis) in their structures and, furthermore, tendencies of trade specialization. While some of the CEECs have reduced dramatically (or even lost completely) their inter-industry specialization towards labour-intensive, low-skill branches and made some inroads into technology-driven and skill-intensive branches, others show clearly that their specialization structures got 'locked in' (at least so far) in the labour-intensive, low-skill sectors. We take this as support of our basic hypothesis that catching-up patterns can give rise to '*comparative advantage switchovers*' if countries can utilize the high potential for productivity growth (and, as we shall see below, of product quality up-grading) in industries in which the initial technological (and product quality) gaps are rather high. Alternatively, countries which cannot utilize this potential remain locked in a specialization pattern which remains the typical one between (technologically) advanced and less advanced economies.

Table 5.2 **Export structure of CEECs compared to EU-North and EU-South**

Table 5.2a **Export shares (taxonomy I – factor intensities) – differences to EU-North**

	Czech Republic		Hungary		Poland		Slovak Republic		Slovenia		Bulgaria		Romania	
	1995	2000	1995	2000	1995	2000	1995	2000	1995	2000	1995	2000	1995	2000
1 mainstream	7,65	8,95	-0,83	-3,42	-4,37	-0,56	-1,34	2,02	6,96	7,84	-10,32	-8,95	-7,28	-5,13
2 labour-intensive	14,37	8,13	11,11	2,07	25,88	19,44	13,59	8,90	16,64	12,58	10,46	21,50	32,33	35,84
3 capital intensive	0,36	-4,10	-3,09	-10,15	1,70	-3,35	13,79	1,96	-5,52	-3,09	25,41	16,53	3,68	-7,99
4 marketing-driven	-6,22	-4,47	-1,07	-4,85	-5,44	-2,73	-7,80	-4,94	-7,99	-5,01	-0,58	-0,03	-2,59	3,08
5 technology driven	-16,16	-8,51	-6,12	16,35	-17,77	-12,80	-18,24	-7,95	-10,10	-12,32	-24,97	-29,05	-26,14	-25,79

	Estonia		Latvia		Lithuania		EU-South		EU-North (Shares)	
	1995	2000	1995	2000	1995	2000	1995	2000	1995	2000
1 mainstream	-10,66	-12,24	-14,21	-15,27	-14,88	-12,46	-6,60	-7,37	21,67	20,82
2 labour-intensive	27,39	18,06	20,75	46,93	22,49	34,18	12,37	1,84	11,39	11,60
3 capital intensive	8,01	-5,51	31,36	7,99	22,38	9,33	-3,23	2,56	23,81	23,37
4 marketing-driven	-8,00	-6,33	-10,90	-8,12	-6,26	-3,63	4,56	7,00	15,53	11,62
5 technology driven	-16,73	6,01	-27,00	-31,53	-23,74	-27,42	-7,11	-4,02	27,60	32,59

Table 5.2b **Export shares (taxonomy II – skill intensities) – differences to EU-North**

	Czech Republic		Hungary		Poland		Slovak Republic		Slovenia		Bulgaria		Romania	
	1995	2000	1995	2000	1995	2000	1995	2000	1995	2000	1995	2000	1995	2000
1 low skill	6,54	-3,32	9,41	-7,79	17,08	4,77	12,68	1,42	3,94	-0,08	38,28	45,81	38,06	36,64
2 medium skill/blue collar	7,33	16,52	3,92	9,36	11,27	20,15	5,80	13,82	12,85	16,61	-13,42	-14,23	-3,90	-5,40
3 medium skill/white collar	-7,11	-8,09	-2,34	0,92	-14,05	-11,91	-5,43	-7,53	-6,39	-7,20	-11,90	-20,14	-19,28	-17,64
4 high skill	-6,77	-5,11	-10,99	-2,49	-14,30	-13,01	-13,05	-7,71	-10,40	-9,34	-12,96	-11,44	-14,87	-13,60

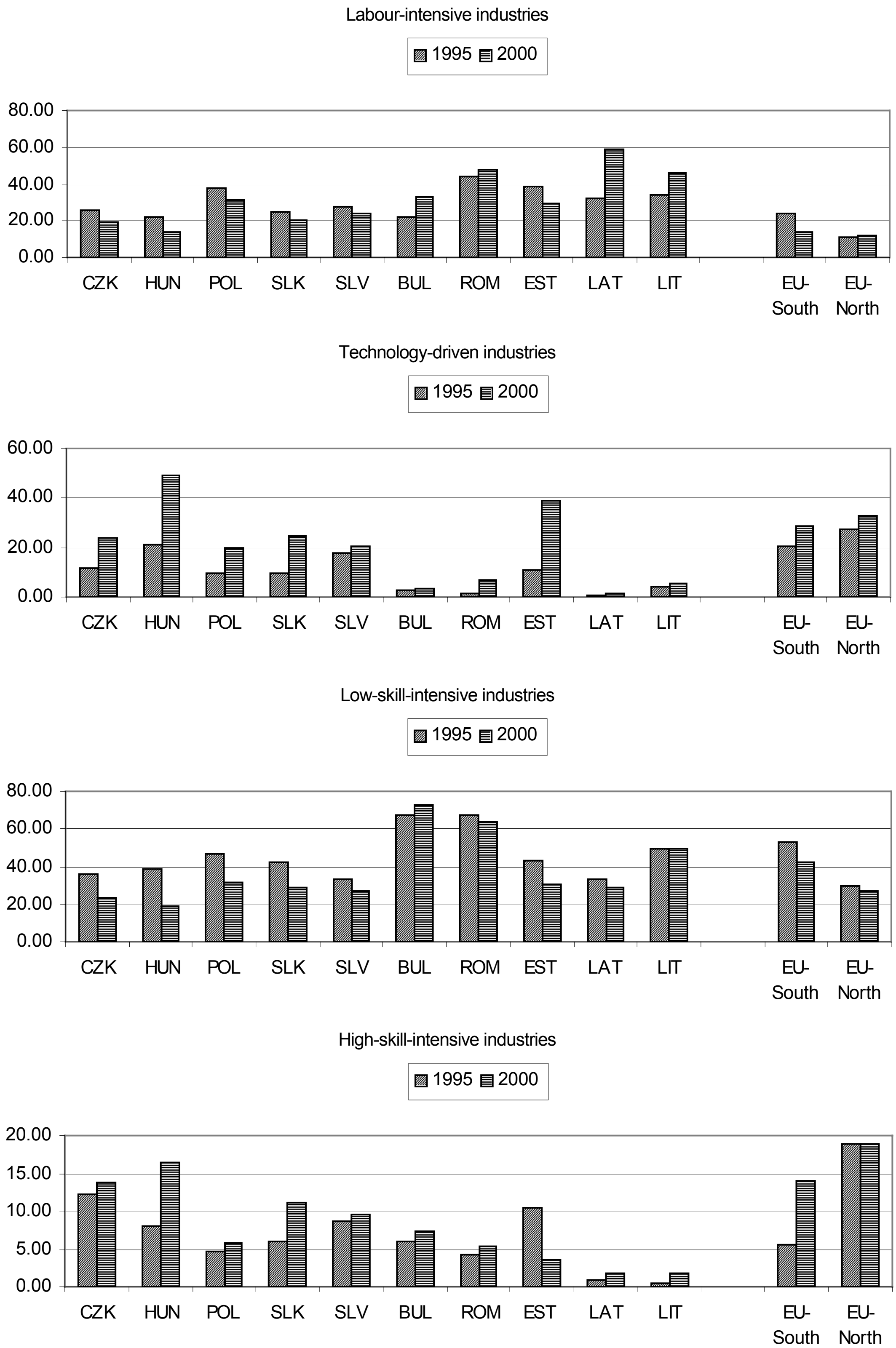
	Estonia		Latvia		Lithuania		EU-South		EU-North (Shares)	
	1995	2000	1995	2000	1995	2000	1995	2000	1995	2000
1 low skill	13,29	4,01	3,68	2,10	19,75	22,05	23,36	14,88	29,41	26,97
2 medium skill/blue collar	2,76	7,95	3,08	24,77	-5,28	-1,34	1,67	-2,75	19,59	20,56
3 medium skill/white collar	-7,50	3,26	11,25	-9,75	4,07	-3,56	-11,49	-7,28	32,00	33,62
4 high skill	-8,55	-15,21	-18,00	-17,12	-18,53	-17,15	-13,54	-4,85	19,00	18,86

Note: Differences of export shares between CEECs and EU-South to EU-North; export shares for EU-North.

Source: Comext data base and own calculations

Figure 5.2

Shares of different industry groupings in exports to EU



Source: Comext database; own calculations

However, we have still to be cautious at this stage: What we have analysed in this section was a distinct pattern of *inter-industry specialization* which emerges in trade between the CEECs and the EU. However, the analysis of inter-industry specialization is only one aspect of trade specialization; the other would be *intra-industry specialization*, i.e. the specialization on particular production stages or on product quality segments within an industry. This will be the subject of the next section 5.3.

Before we come to this, we just want to point out that there is also well-established strong evidence (see Landesmann, 2000 and WIIW, 2001) for *growing intra-industry trade* between the more advanced CEECs and the EU. This is in line with the 'new' trade theory which suggests that trade among industrialized countries is motivated by product differentiation and economies of scale. Measured by Grubel-Lloyd indices, intra-industry trade has been most pronounced in EU trade of the Czech Republic, Slovenia and Hungary whereas it has been lowest in Latvia, Lithuania and Romania. Moreover, over the period 1995-2000, intra-industry trade has been growing most rapidly in the Czech Republic and (less pronounced) in Poland; it stagnated either at a relatively high level in Hungary, Slovenia and the Slovak Republic, or at a low level in the remaining candidate countries. Compared with the early period of transition (and even more so with the pre-transition period), intra-industry trade between the more advanced CEECs (the Czech and Slovak Republics, Hungary and Poland) and the EU has increased further whereas it has more or less stagnated in Bulgaria and Romania. Judging also by the high shares in exports and imports, intra-industry trade (including outward processing trade) has been of particular importance in textiles as well as in electrical, optical and transport equipment. Again, the evidence on the levels and rates of change of intra-industry trade points towards a strong differentiation amongst the CEECs.

5.3 Product quality and quality up-grading of CEE exports to the EU

In this section we use export unit values to proxy differences in product quality of different producers of tradable goods (in our case CEE exporters and EU producers). If products are defined at a very detailed level and comparisons are made in the same market (in our case, the EU market) then – under certain conditions concerning market structure – differences in price do reveal differences in 'product quality' (including consumer loyalty to particular producers, marketing and product design differences, after sales services, etc.). The importance of price differences in trade even at the most detailed level of product classifications (in our case at the 8-digit CN level) has given rise to a number of studies of the phenomenon of '*vertical intra-industry trade*', i.e. trade in products with quality differences (see Greenaway, Hine and Milner, 1994, Fontagné and Freudenberg, 1997, Jansen and Landesmann, 1999). It has been pointed out in previous studies that 'vertical intra-industry trade' is particularly relevant in trade relations between East and West

European countries (see Burgstaller and Landesmann, 1999, Aturupane, Djankov and Hoekman, 1999).

We shall present some of the most recent evidence on the present position of the CEE producers in vertical intra-industry trade relations with the EU. The analysis of whether CEE producers trade at the low-, medium- or high-quality end of the product range can serve as an important indicator for industrial strengths and weaknesses of CEE producers and, furthermore, can give rise to interesting analyses of emerging production networks (see Baldone et al, 2001). We shall also analyse whether there is evidence a narrowing down of the 'price/quality gaps' between CEE and EU producers and how this 'product quality catching-up' is proceeding across the different candidate countries. In the following we shall briefly introduce the methodology adopted to analyse product quality gaps at the product and industry level.

5.3.1 Methodology of the calculation of relative unit values

In the calculation of relative unit values of traded products we use the COMEXT trade database at the most detailed 8-digit level. Denoting the value of exports to the EU of commodity i by country c in year t by v_{it}^{c} and the quantity (measured in tons) by x_{it}^{c}, the export unit value is defined as

$$u_{it}^{c} = v_{it}^{c} / x_{it}^{c} \qquad (1)$$

The unit values of country c's exports to the EU are then compared to the unit values of total EU imports (from the world, including intra-EU trade) by calculating the logs of the unit value ratios

$$r_{it}^{c} = \ln\left(u_{it}^{c} / u_{it}^{EU}\right) \qquad (2)$$

where u_{it}^{EU} denotes the unit value of total EU imports for a particular commodity i in year t. Taking the logarithm of (u_{it}^{c} / u_{it}^{EU}) ensures a symmetric aggregation across products for ratios larger and smaller than 1 (see below). In logs, the ratio is thus larger (smaller) than zero if the export unit value of country c is larger (smaller) than the unit value of total EU imports.

We shall not present information at the very detailed (8-digit) product level but aggregate the unit value ratios to the level of (3-digit NACE) industries and further to industry groupings. This is done by constructing a weighted sum of the unit value ratios r_{it}^{c} across the products belonging to a particular industry j (or an industry group). The weight used for a particular commodity i in such an aggregation is the share of its export value in the industry's exports of country c. Denoting the set of commodities i belonging to an aggregate j (industry or industry grouping) by $i \in I(j)$ the weights are calculated as

$$w_{it}^{c} = v_{it}^{c} / \sum_{i \in I(j)} v_{it}^{c} \qquad (3)$$

The unit value ratio for a particular aggregate j is then

$$r_{jt}^{c} = \sum_{i \in I(j)} r_{it}^{c} w_{it}^{c} \qquad (4)$$

This measure can be interpreted analogously to the unit value ratios for a particular commodity as mentioned above. For ease of interpretation we report however

$$uvr_{jt}^{c} = \exp(r_{jt}^{c}) - 1 \qquad (5)$$

to which we also refer as *unit value ratios* of industry (or industry grouping) j. This measure can then be more easily interpreted than the log values, namely as the percentage deviation from the average EU import unit value. We shall also refer to these ratios as '*export price/quality gaps*'; they can be positive or negative.[10]

5.3.2 Aggregate export price gaps and numbers of products exported to the EU

As a first overview of relative unit value ratios uvr_{t}^{c} (or 'export price/quality gaps') at the aggregate level (i.e. calculated across all manufacturing products traded with the EU) we can see in Figures 5.2a and 5.2b a comparison of these unit value ratios between the ten CEE candidate countries and the EU members for the years 1995 to 2000.[11] Remember that the zero level refers to the average price line for total EU imports and the values off the zero price line can be interpreted as (positive or negative) export price gaps (in %) relative to that average.

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[10] As the COMEXT trade data can contain errors at the detailed product level, we have – in our procedure of calculating unit value ratios – deleted very extreme levels of relative unit values. The criterion we used to classify an observation as an outlier was derived from the levels of the so-called 'adjucant values' in the distribution of the unit value ratios in the following way: The lower (upper) adjucant values are defined as the 25th (75th) percentile of the data minus (plus) 1.5 times the interquartile range (i.e. the range from the 25th to the 75th percentile). The lowest adjucant value in the data was found for Bulgaria in 1995 with about 2.5 ($\approx$ -ln 12) and the highest adjucant value for Slovenia in 1999 with about 1.75 ($\approx$ ln 5.75). In the calculations we dropped observations where $r_{jt}^{c} > \ln | 20 |$, i.e. at a value larger than the highest and lowest adjucant values in the sample. This means that observations where the ratio (u_{it}^{c} / u_{it}^{EU}) was higher than 20 or lower than 1/20 have been classified as outliers and removed from the sample. Using this criterion we think that extreme outlier values have been removed without biasing the data.

[11] Because of a break in the NACE industry classification and hence in the product-to-industry converters, we shall limit our analysis in this section to the years 1995 to 2000. For an analysis of developments over the earlier period, see the studies by Burgstaller and Landesmann (1999), and Stehrer, Landesmann and Burgstaller (1999).

Figure 5.2a

Export price gaps – all manufacturing products traded with the EU

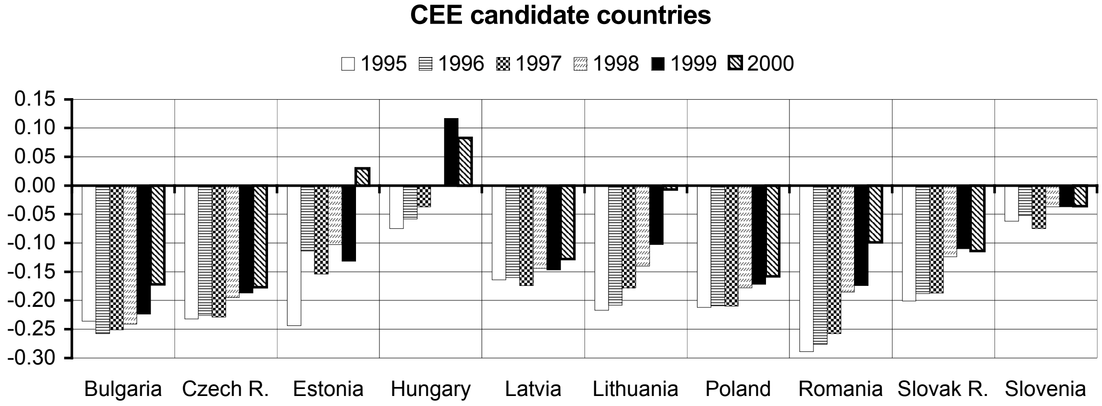
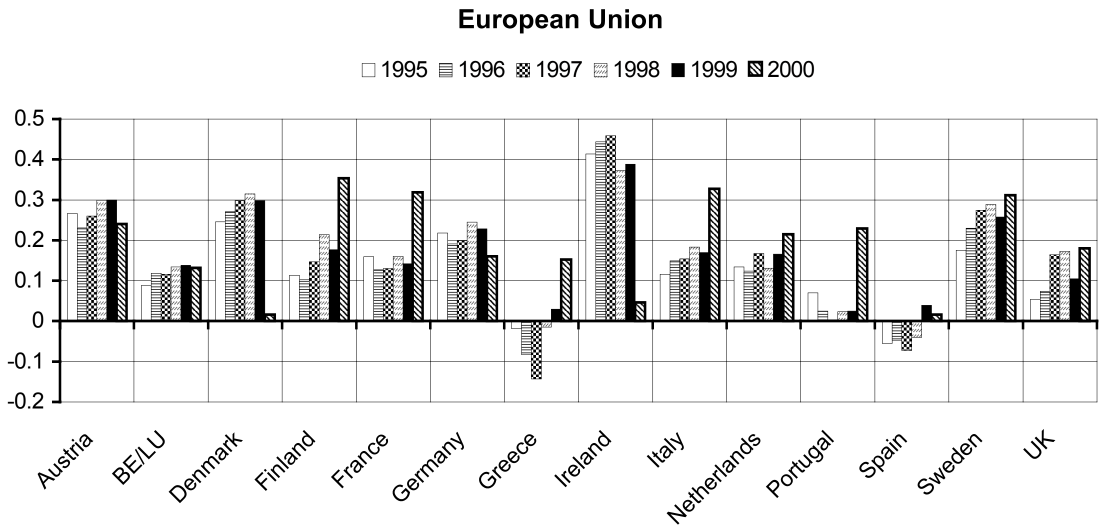


Figure 5.2b



Note: Export price gaps have been calculated from detailed product-by-product comparisons and are expressed in percentage deviations from the average price of the products traded in EU markets (i.e. all imports to the EU including intra-EU).

Source: Own calculations based on Eurostat Comext Database.

In the first instance, we can see that – in the aggregate – EU members sell their products at prices above those of total EU imports, while candidate countries sell their products on EU markets below those of total EU trade. Exceptions amongst the EU member states are the Southern EU countries (Greece, Spain and Portugal), which sell at or just below the measured average (and weighted) price levels of total EU imports.

One can see some remarkable differences across the candidate countries. In 1995 the best performing country was Slovenia with a gap of about 6.4% and Hungary with 7.5%. Latvia performed third with about 16% followed by Slovakia with a 20% gap. The other countries experienced gaps of 22% (Latvia) to 29% (Romania). Over time all countries succeeded in catching up in export unit prices, only Bulgaria remained more or less stable at a gap of 23-25%. Hungary and Slovenia were the leaders also in 2000, although these two countries have changed their ranking. The two Baltic countries (Estonia and Lithuania) also experienced remarkable catching-up processes. Further, Romania reduced its gap from 29% in 1995 to about 17% in 2000.

We now move on to check on '*product coverage*', i.e. the range of products exported by country c relative to the range of products traded in the EU market as a whole. This indicator can be seen as a measure to which degree a country participates in the range of (horizontally or vertically) product differentiated trade (within an industry or industry grouping or in the aggregate). The number of products exported by a country depends, of course, on the size of the economy (one expects that smaller economies export a smaller range of goods than larger ones) but also other determinants such as technologies adopted, abilities to participate in horizontal product differentiation, transport costs, market barriers, etc. Figures 5.3a and 5.3b present the product coverage ratios (i.e. the number of products exported by country c relative to the total number of products imported by the EU) in 1995 and 2000. Such product coverage ratios have also been calculated for individual industries and industry groupings but will not be presented here, although we shall refer to these in the text.

We can see that the CEE candidate countries with the highest coverage ratios (Czech Republic, Hungary and Poland) have product coverage ratios in line with those for Austria, Denmark and Sweden, but substantially below the smaller ('core') EU countries, Belgium and Netherlands, as well as the larger EU member states (France, Germany, Italy, Spain, UK). Romania, the Slovak Republic and Slovenia have product coverage ratios in line with Finland, Ireland and Portugal, while the small Baltic states and Bulgaria show coverage ratios below that of Greece (the EU country with the smallest coverage). At this aggregate level, we can conclude that CEE candidate countries have reached coverage ratios below the 'old' EU member states, but quite close to the more recent entrants. Except for Bulgaria, the coverage ratios have increased for all candidate countries over the period 1995 to 2000, although at slow rates.

Figure 5.3a

Product coverage of CEE exports, EU(15) imports = 1

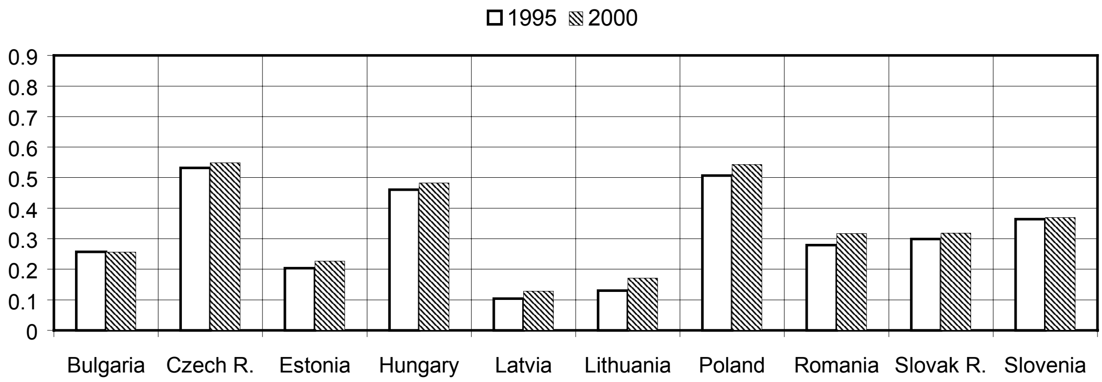
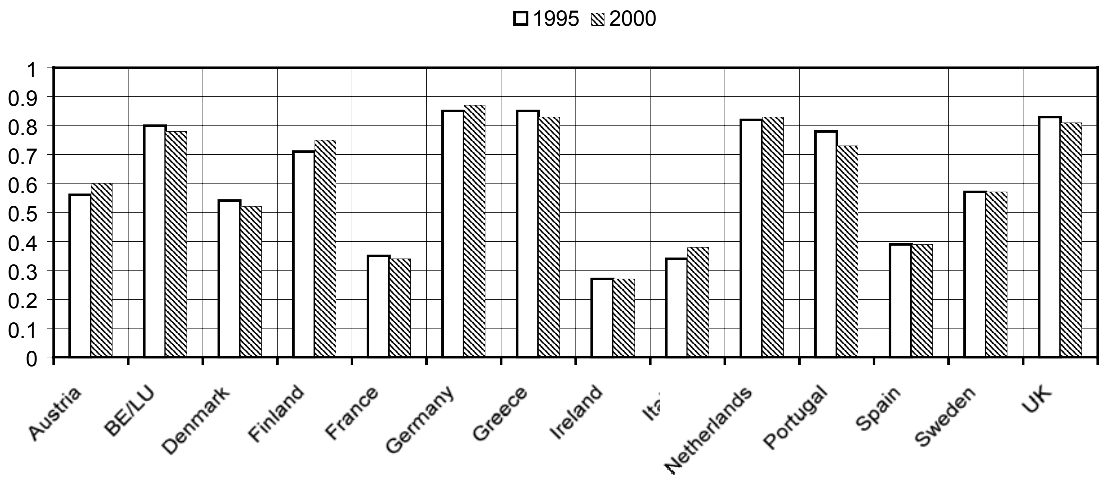


Figure 5.3b

Product coverage of EU exports, EU (15) imports = 1



Note: Product coverage refers here to the share of product items exported by a country to the EU relative to the total number of product items traded in EU markets (i.e. in total EU imports including intra-EU trade).

Source: Own calculations based on Eurostat Comext Database.

5.3.3 Unit value ratios at the level of industry groupings

We now return to the taxonomies used in section 5.2 which led to the identification of different industry groupings either by factor input criteria or industrial organization features and look at variations in the positions of CEE producers in unit value ratios across the different industry groupings thus identified.

Table 5.3 presents the calculated unit value ratios uvr_{jt} ('export price gaps') across the five identified industry clusters and for the whole group of CEE candidate countries. The last column also shows the (per annum) growth rates of unit value ratios over the period 1995 to 2000.

Table 5.3

Unit value ratios for taxonomy I (factor inputs) – aggregate over all CEE candidate countries, in %

Industry clusters	1995	1996	1997	1998	1999	2000	p.a. growth 1995-2000
1 mainstream	-35.5%	-37.2%	-34.2%	-29.3%	-26.8%	-28.2%	1.46%
2 labour-intensive	-23.7%	-18.5%	-21.9%	-16.0%	-14.4%	-14.0%	1.94%
3 capital-intensive	-12.3%	-12.9%	-12.3%	-13.1%	-11.7%	-7.7%	0.91%
4 marketing-driven	-16.6%	-15.6%	-16.8%	-13.2%	-16.1%	-15.2%	0.29%
5 technology-driven	-23.4%	-21.3%	-16.2%	-10.2%	-2.5%	0.1%	4.71%

Note: Unit value ratios refer here to the ratios of export prices sold by a particular country to the EU (in the different industry categories) relative to the average import prices in total EU trades (in the respective industry categories).

Source: Own calculations based on Eurostat Comext Database.

We can see the following: The highest gap in 1995 was in the industries classified as 'mainstream' with a gap of about 35%. In labour-intensive and technology-driven industries the gap was about 23%. The best performer in 1995 was the group of industries classified as 'capital-intensive' with a gap of only 12%. Important for our story of the dynamics of catching-up is that the *growth rates were highest in the technology-driven industries* with an exponential (per annum) growth rate of about 4.7%, second highest in the mainstream industries with 1.5% and the labour-intensive industries with 1.9%. This pattern of growth changed the ranking of industries in 2000, where the technology-driven industries reached the average EU import price level. The mainstream industries show now the biggest gap with about 28%.

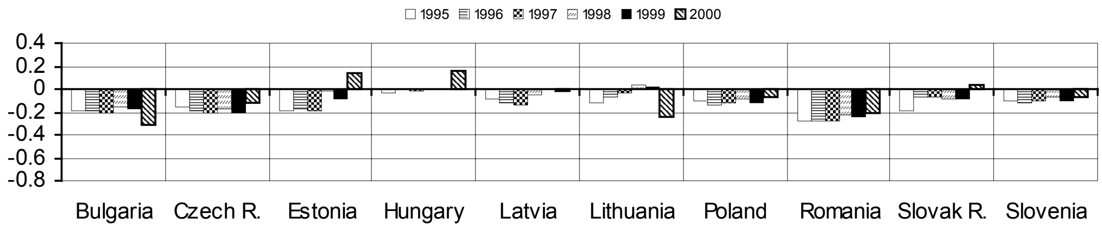
The pattern of the gaps and the catching-up in the particular classes for the individual candidate countries can be seen in Figure 5.4. In this figure the y-axes are scaled identically for all groupings of industries. The figures thus allow to compare levels and developments for countries and industry groups simultaneously. We can see that:

– In the technology-driven industries the most successful countries are Hungary, the Slovak Republic and Slovenia where the unit value ratios uvr_{jt}^{c} are at a level of about zero and have been strongly increasing for Hungary. The other countries had a gap in 1995 between 20% (Poland) and more than 70% (Estonia). There have been catching-up processes taking place in almost all countries (especially remarkable for Estonia). All the countries succeeded in diminishing the gaps which were between 10% and 30% in 2000. Hungary achieved above-average unit value ratios in this industry grouping (+20% in 2000).

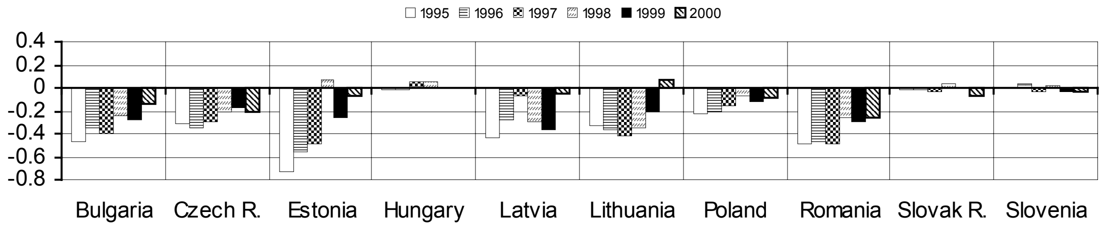
Figure 5.4

Unit value ratios by taxonomy I (factor inputs)

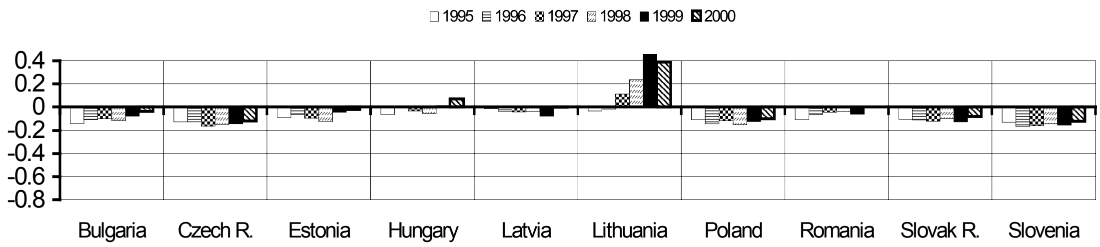
Technology-driven industries



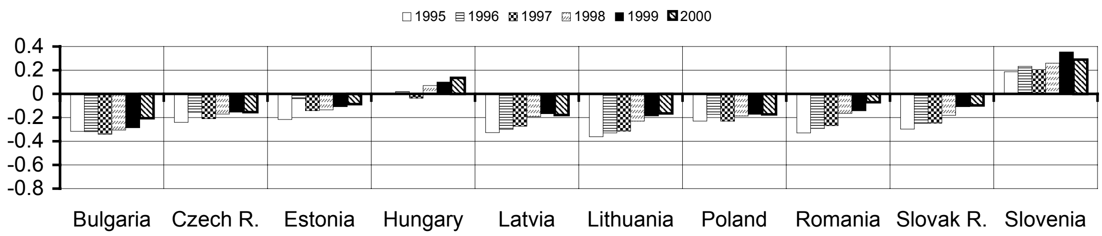
Marketing-driven industries



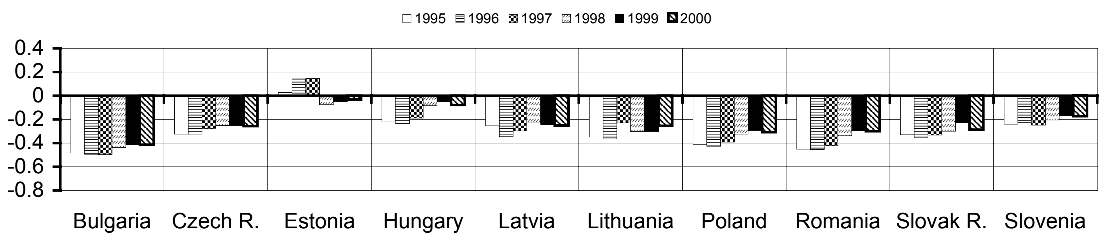
Capital-intensive industries



Labour-intensive industries



Mainstream industries



Note: Unit value ratios refer here to the ratios of export prices sold by a particular country to the EU (in the different industry categories) relative to the average import prices in total EU trades (in the respective industry categories).

Source: Own calculations based on Eurostat Comext Database.

– Such a catching-up process cannot be observed in the marketing-driven industries where the gap is more or less stable at about 10% to 20% for most countries. The best performers are again Hungary and Lithuania which succeeded in fully catching up with the average price levels. Other quite well performing countries are Estonia, Latvia, the Slovak Republic and Slovenia. On the other hand, Bulgaria, the Czech Republic and Romania show a gap of about 20% or even more.
– The capital-intensive industries were the industries for which the gap in 1995 was smallest with a gap of about only 12% as stated above. Here only very little convergence can be observed with the remarkable exception of Lithuania.
– In the labour-intensive industries the gap in 1995 ranges from 10% (Czech Republic, Estonia, Romania, Slovak Republic) to about 30% (Bulgaria). Here Slovenia sticks out with 'positive gaps' of +25% and Hungary also reached a level above the average.[12]
– Finally, the industries classified as mainstream show high gaps in 1995 (on average 35%) with at times remarkable catching-up processes taking place in all countries so that the gaps reach about 25% on average in 2000. Here the best performing country is Estonia with export unit values comparable to the EU average.

Further one may look at the number of products exported to the EU over time. The catching-up process in quality levels may stem from either an increase in quality of particular commodities or from the widening of the range of products exported in the more sophisticated types of industries.

Thus we take a look at the *product coverage ratios* in the five industry groupings. In order to control for a country's overall product coverage ratio, we look at the product coverage ratios in each of the industry groupings relative to the national average. Taking an (arithmetic) average of these relative coverage ratios in the different industry groupings across all candidate countries, we find that they have high relative coverage ratios in mainstream and labour-intensive branches (on average +37% and +75% respectively above the national average in 2000) and have – again relative to the respective national product coverage ratios – a relatively low product coverage in the marketing- and the technology-driven industries (-36% and -34% respectively). Over time (i.e. over the period 1995-2000), however, the product coverage ratios increased (relative to the national average) the most in two areas: labour-intensive products (+7%) and in technology-driven products (+8%), and fell in the capital-intensive industries (-12%). We shall return with a summary assessment of these developments in coverage ratios after presenting the equivalent results obtained from applying taxonomy II based on skill groupings.

---

12 We should remark here that high relative export prices can also reveal that producers have become uncompetitive in certain branches. A closer analysis requires a joint examination of price and market share movements, a point developed by Aiginger in his analysis (Aiginger, 1997).

Utilizing the alternative classification (*taxonomy II* introduced above) industry groups are classified according to relative labour skill requirements. Again we first present in Table 5.4 the 'export price gaps' for the aggregate of the candidate countries by these four industry groupings over the period 1995-1999 and again the p.a. growth rates in the last column. The export price gaps for the different accession countries are then given in Figure 5.5 (the y-axes are again scaled identically to allow cross-industry comparisons).

Table 5.4

Unit value ratios for taxonomy II (labour skills) – aggregate over all CEE candidate countries, in %

Industry clusters	1995	1996	1997	1998	1999	2000	p.a. growth 1995-2000
1 low-skill	-13.7%	-13.6%	-12.9%	-8.9%	-8.0%	-7.6%	1.2%
2 medium-skill / blue-collar	-29.0%	-22.5%	-24.8%	-19.2%	-15.6%	-14.0%	3.0%
3 medium-skill / white-collar	-18.4%	-21.8%	-20.0%	-13.5%	-15.0%	-7.2%	2.2%
4 high-skill	-53.7%	-51.9%	-44.1%	-42.1%	-26.4%	-34.6%	3.8%

Note: Unit value ratios refer here to the ratios of export prices sold by a particular country to the EU (in the different industry categories) relative to the average import prices in total EU trades (in the respective industry categories).

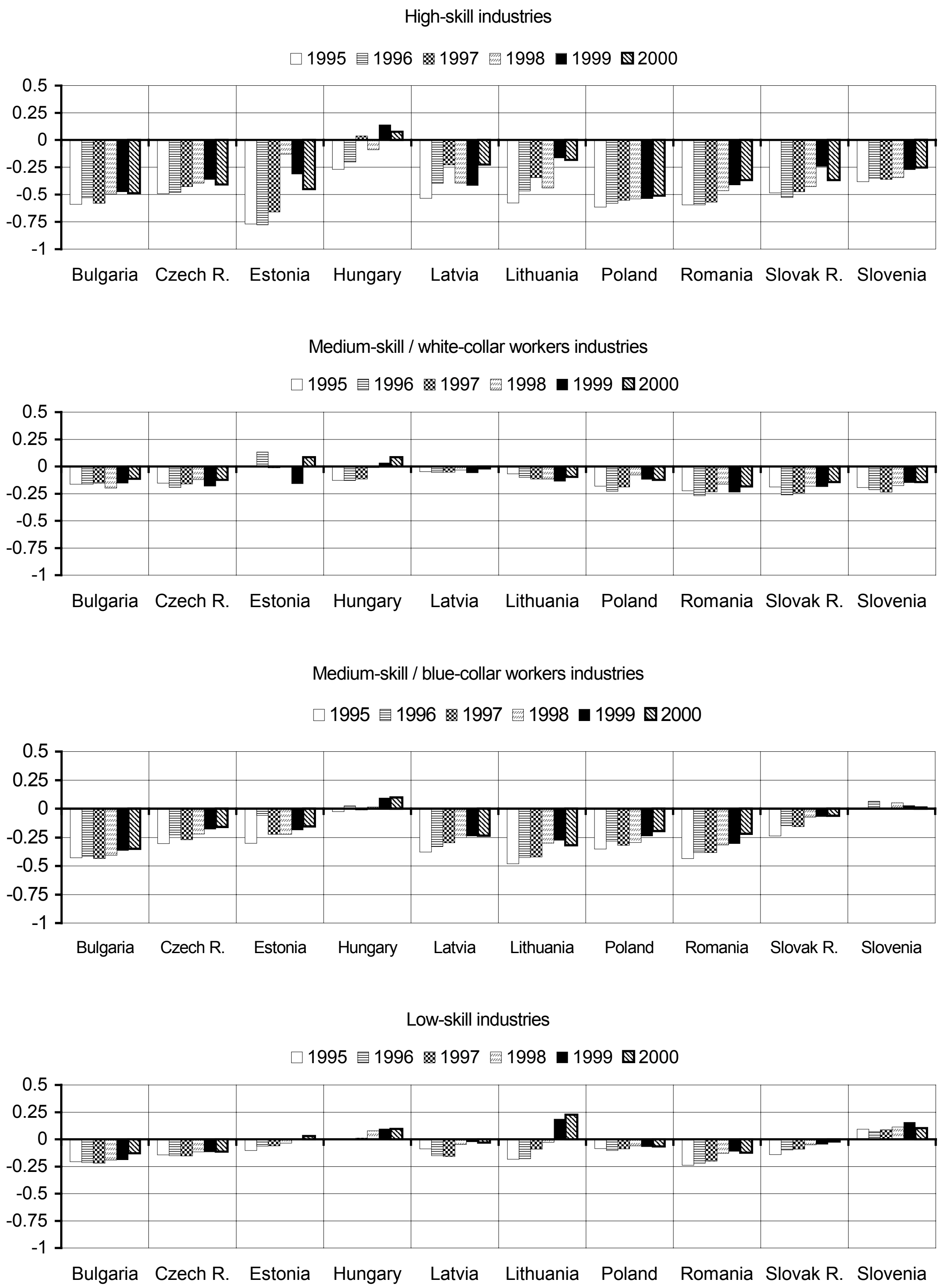
Source: Own calculations based on Eurostat Comext Database.

Table 5.4 shows that for candidate countries as a whole the largest gap in 1995 could be measured in the industries classified as 'high-skill-intensive' industries with a gap of about 50%. The smallest gap in 1995 could be observed in the 'low-skill-intensive' industries. Between the two medium-skill-intensive industry groupings the gap is smaller in the medium-skill/white-collar industries (with about 18%) compared to the medium-skill/blue-collar industries with about 30%. The highest growth rates of the unit value ratios over the period 1995 to 2000 occurred in the high-skill industries (the class of industries with the highest gaps in 1995) with an exponential growth rate of about 3.8% and for the medium-skill/blue-collar industries with a growth rate of about 3%.

Looking at Figure 5.5 we can again observe that the highest gaps in 1995 can be observed in the *high-skill* and *medium-skill/blue-collar workers industries* with gaps of about or even more than 50% in some countries (especially in Bulgaria, Estonia, Poland and Romania). In the other two categories, *medium-skill/white-collar workers* and *low-skill industries*, the gap in 1995 was about 20% to 25%. But here are some remarkable country differences. Especially Hungary performed better than the other countries in all four categories and has by 2000 no negative export price gaps in any of the industry groupings and a particularly good performance in the high-skill grouping.

Figure 5.5

Unit value ratios by taxonomy II (labour skills)



Note: Unit value ratios refer here to the ratios of export prices sold by a particular country to the EU (in the different industry categories) relative to the average import prices in total EU trades (in the respective industry categories).

Source: Own calculations based on Eurostat Comext Database.

As to product coverage ratios, we just want to mention again the fact that with regard to movements over time, it is in the high-skill industries that the CEE product coverage ratios are rising the fastest compared to the other types of industry groupings; this is the case in all countries with the exception of Bulgaria. This means that (beside the quality improvement of individual commodities) it is the other component of a catching-up process which is particularly important in the high-skill industries, i.e. the widening of the range of exported products. This is in line with what we mentioned earlier for the technology-driven industries.

5.4 Regressions on export price catching-up

We now report the results of some simple cross-section regressions. The underlying data points used for the regressions are the export unit ratios by industry groupings and by country (see figures 5.4 and 5.5). On average we saw that the gaps are highest (in 1995) in the high-skill industries followed by the medium-skill/blue collar industries. In the latter the range of gaps in 1995 is largest.

We shall first refer to the results using the skill taxonomy
1... low-skill
2... medium-skill/blue collar
3... medium-skill/white collar
4... high-skill

To get some estimates on the speed of convergence we estimated the following simple cross-section model:

$$\Delta y = \alpha + y_{1995} + \varepsilon$$

where Δy is the growth rate of the unit value ratio between 1995 and 2000. For the overall sample (i.e. pooling the regressions over industry types) we get the following results:

```
Source |       SS       df       MS              Number of obs =      40
-------------+------------------------------           F(  1,    38) =    4.13
       Model |  .002614787     1  .002614787           Prob > F      =  0.0492
    Residual |  .024077897    38  .000633629           R-squared     =  0.0980
-------------+------------------------------           Adj R-squared =  0.0742
       Total |  .026692684    39  .000684428           Root MSE      =  .02517

------------------------------------------------------------------------------
          Dy |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       y1995 |  -.0395168   .0194528    -2.03   0.049    -.0788969   -.0001368
       _cons |   .0194933   .0065535     2.97   0.005     .0062264    .0327602
------------------------------------------------------------------------------
```

However, there are some data points which are outliers: Lithuania in the low-skill sectors, and Romania, Estonia and Hungary in the medium-skill/white-collar sector show very high growth rates. Dropping these data points we get the following results:

```
Source |       SS       df       MS              Number of obs =      36
-------------+------------------------------           F(  1,    34) =   25.11
       Model |  .005838371     1  .005838371           Prob > F      =  0.0000
    Residual |  .007904558    34  .000232487           R-squared     =  0.4248
-------------+------------------------------           Adj R-squared =  0.4079
       Total |  .013742929    35  .000392655           Root MSE      =  .01525

------------------------------------------------------------------------------
          Dy |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       y1995 |  -.0610621    .012185    -5.01   0.000     -.085825   -.0362992
       _cons |   .0072944   .0042787     1.70   0.097    -.0014009    .0159897
------------------------------------------------------------------------------
```

This second results performs much better as the R^2 is rising to 42 per cent. The results show that the catching-up parameter is quite high. The half-time of catching-up is about 11 years (for the second estimation).

However, there are marked differences across industry groups: The next set of regressions are undertaken for each industry group separately:

```
_______________________________________________________________________________
-> fact = 1

      Source |       SS       df       MS              Number of obs =       9
-------------+------------------------------           F(  1,     7) =    1.95
       Model |  .000153096     1  .000153096           Prob > F      =  0.2053
    Residual |  .000549544     7  .000078506           R-squared     =  0.2179
-------------+------------------------------           Adj R-squared =  0.1062
       Total |   .00070264     8   .00008783           Root MSE      =  .00886

------------------------------------------------------------------------------
          Dy |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       y1995 |  -.0435906    .031215    -1.40   0.205    -.1174023    .0302211
       _cons |   .0104156   .0043454     2.40   0.048     .0001404    .0206908
------------------------------------------------------------------------------

_______________________________________________________________________________
-> fact = 2

      Source |       SS       df       MS              Number of obs =      10
-------------+------------------------------           F(  1,     8) =    4.07
       Model |  .000399444     1  .000399444           Prob > F      =  0.0783
    Residual |   .00078496     8   .00009812           R-squared     =  0.3373
-------------+------------------------------           Adj R-squared =  0.2544
       Total |  .001184404     9    .0001316           Root MSE      =  .00991

------------------------------------------------------------------------------
          Dy |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       y1995 |  -.0402033   .0199257    -2.02   0.078    -.0861519    .0057453
       _cons |     .01548   .0066606     2.32   0.049     .0001206    .0308394
------------------------------------------------------------------------------

_______________________________________________________________________________
-> fact = 3

      Source |       SS       df       MS              Number of obs =       7
-------------+------------------------------           F(  1,     5) =    5.83
       Model |  .000111975     1  .000111975           Prob > F      =  0.0606
```

```
    Residual |  .000096105     5  .000019221           R-squared     =  0.5381
-------------+------------------------------           Adj R-squared =  0.4458
       Total |   .00020808     6   .00003468           Root MSE      =  .00438

------------------------------------------------------------------------------
          Dy |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       y1995 |  -.0723075   .0299577    -2.41   0.061    -.1493164    .0047013
       _cons |   -.003478   .0045693    -0.76   0.481    -.0152238    .0082678
------------------------------------------------------------------------------
```

```
-> fact = 4

      Source |       SS       df       MS              Number of obs =      10
-------------+------------------------------           F(  1,     8) =    0.02
       Model |  .000015764     1  .000015764           Prob > F      =  0.8795
    Residual |  .005144972     8  .000643122           R-squared     =  0.0031
-------------+------------------------------           Adj R-squared = -0.1216
       Total |  .005160736     9  .000573415           Root MSE      =  .02536

------------------------------------------------------------------------------
          Dy |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       y1995 |  -.0096621   .0617142    -0.16   0.879    -.1519753    .1326512
       _cons |   .0377533   .0337133     1.12   0.295    -.0399896    .1154962
------------------------------------------------------------------------------
```

As can be seen, convergence takes place only in the medium-skill/blue and medium-skill/white collar industry groups. Half-time is lower in the medium-skill/white collar group (Note however that the number of observations is quite small.) Thus significant convergence takes place only in the medium-skilled industries and the speed of convergence is faster in the medium-skill/white collar industries.

Next we refer to the alternative industry taxonomy:
1... Mainstream
2... Labour-intensive
3... Capital-intensive
4... Markteing driven
5... Technology driven

The results for the pooled sample are listed below. Again, we find quite high convergence parameters which are highly significant. Running the regressions on each industry group separately we can see that the pooled result is driven only by convergence in the 'mainstream' segment and the 'technology driven' segment.

```
Source |       SS       df       MS                    Number of obs =      50
-------------+------------------------------           F(  1,    48) =   17.49
       Model |  .051119295     1  .051119295           Prob > F      =  0.0001
    Residual |  .140325819    48  .002923455           R-squared     =  0.2670
-------------+------------------------------           Adj R-squared =  0.2517
       Total |  .191445114    49  .003907043           Root MSE      =  .05407

------------------------------------------------------------------------------
          Dy |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       y1995 |  -.1916029   .0458203    -4.18   0.000    -.2837308    -.099475
       _cons |  -.0086268   .0123667    -0.70   0.489    -.0334918    .0162382
------------------------------------------------------------------------------
```

```
-> fact = 1

      Source |       SS       df       MS              Number of obs =      10
-------------+------------------------------           F(  1,     8) =    6.81
       Model |  .000648904     1  .000648904           Prob > F      =  0.0312
    Residual |   .00076236     8  .000095295           R-squared     =  0.4598
-------------+------------------------------           Adj R-squared =  0.3923
       Total |  .001411264     9  .000156807           Root MSE      =  .00976

------------------------------------------------------------------------------
          Dy |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       y1995 |  -.0582752   .0223321    -2.61   0.031     -.109773   -.0067774
       _cons |  -.0040232   .0074395    -0.54   0.603    -.0211788    .0131324
------------------------------------------------------------------------------

-> fact = 2

      Source |       SS       df       MS              Number of obs =      10
-------------+------------------------------           F(  1,     8) =    1.63
       Model |  .000224215     1  .000224215           Prob > F      =  0.2373
    Residual |  .001099565     8  .000137446           R-squared     =  0.1694
-------------+------------------------------           Adj R-squared =  0.0655
       Total |   .00132378     9  .000147087           Root MSE      =  .01172

------------------------------------------------------------------------------
          Dy |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       y1995 |  -.0286065   .0223974    -1.28   0.237     -.080255    .0230421
       _cons |   .0224211    .006033     3.72   0.006      .008509    .0363332
------------------------------------------------------------------------------

-> fact = 3

      Source |       SS       df       MS              Number of obs =       9
-------------+------------------------------           F(  1,     7) =    0.00
       Model |  3.2386e-07     1  3.2386e-07           Prob > F      =  0.9598
    Residual |  .000830236     7  .000118605           R-squared     =  0.0004
-------------+------------------------------           Adj R-squared = -0.1424
       Total |   .00083056     8   .00010382           Root MSE      =  .01089

------------------------------------------------------------------------------
          Dy |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       y1995 |   .0051736   .0990055     0.05   0.960    -.2289371    .2392843
       _cons |   .0113857   .0105761     1.08   0.317    -.0136227    .0363942
------------------------------------------------------------------------------

-> fact = 4

      Source |       SS       df       MS              Number of obs =      10
-------------+------------------------------           F(  1,     8) =    0.01
       Model |  1.8586e-06     1  1.8586e-06           Prob > F      =  0.9252
    Residual |  .001585965     8  .000198246           R-squared     =  0.0012
-------------+------------------------------           Adj R-squared = -0.1237
       Total |  .001587824     9  .000176425           Root MSE      =  .01408

------------------------------------------------------------------------------
          Dy |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       y1995 |   .0067321   .0695279     0.10   0.925    -.1535995    .1670637
       _cons |   .0139617   .0112632     1.24   0.250    -.0120112    .0399347
------------------------------------------------------------------------------
```

```
-> fact = 5

      Source |       SS       df       MS              Number of obs =      10
-------------+------------------------------           F(  1,     8) =    7.68
       Model |  .069733671     1  .069733671           Prob > F      =  0.0243
    Residual |   .07268429     8  .009085536           R-squared     =  0.4896
-------------+------------------------------           Adj R-squared =  0.4258
       Total |   .14241796     9  .015824218           Root MSE      =  .09532

------------------------------------------------------------------------------
          Dy |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       y1995 |  -.3646448   .1316206    -2.77   0.024    -.6681625    -.061127
       _cons |   -.023558    .049959    -0.47   0.650    -.1387637    .0916477
------------------------------------------------------------------------------
```

The result in the latter case is however somewhat driven by quite high growth rates for Estonia and Romania. Dropping these two observations yields the following results:

```
Source |       SS       df       MS              Number of obs =       8
-------------+------------------------------           F(  1,     6) =    3.82
       Model |  .002033556     1  .002033556           Prob > F      =  0.0984
    Residual |  .003193439     6   .00053224           R-squared     =  0.3890
-------------+------------------------------           Adj R-squared =  0.2872
       Total |  .005226995     7  .000746714           Root MSE      =  .02307

------------------------------------------------------------------------------
          Dy |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       y1995 |  -.0886673   .0453617    -1.95   0.098    -.1996634    .0223287
       _cons |   .0087029    .013114     0.66   0.532    -.0233859    .0407918
------------------------------------------------------------------------------
```

The result remains significant at the 10 % level, however the speed of convergence is significantly lower. Similarly for segment 2 ('labour intensive'), Hungary and Slovenia show relatively high growth rates. Dropping these observations yields the following result for segment 2:

```
Source |       SS       df       MS              Number of obs =       8
-------------+------------------------------           F(  1,     6) =    5.18
       Model |  .000575299     1  .000575299           Prob > F      =  0.0632
    Residual |  .000666761     6  .000111127           R-squared     =  0.4632
-------------+------------------------------           Adj R-squared =  0.3737
       Total |   .00124206     7  .000177437           Root MSE      =  .01054

------------------------------------------------------------------------------
          Dy |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       y1995 |  -.1683366   .0739846    -2.28   0.063    -.3493705    .0126972
       _cons |  -.0189624   .0217313    -0.87   0.416     -.072137    .0342121
------------------------------------------------------------------------------
```

Thus, we find also convergence with very high convergence parameters. The dropped countries Hungary and Slovenia perform then even better than the other countries.

6 The allocation of foreign direct investment across branches

We finally look at two important factors which are generally regarded as important in determining the course of catching-up and the pattern of specialization of the Central and Eastern European countries. We refer here, firstly, to the role of foreign direct investments (FDI) as important carriers of technological and managerial know-how transfer and, secondly (in section 7), to the role of human capital whose existence is seen as crucial in facilitating the adoption of new technologies and as influencing a country's pattern of trade and industrial specialization.

There is broad agreement in the literature that FDI plays an important role in restructuring and in improving competitiveness (see the general evidence world-wide e.g. in UNCTAD, 2001, Barrel and Holland, 2000, and for the CEECs, see e.g. Hunya, 2000). Table 6.1 reports data on FDI stocks in 2000 for seven Central and Eastern European countries. These data were collected from national sources and/or foreign investment agencies. As there are methodological problems in comparing the data across countries (especially for Hungary and Poland) we shall only discuss the structure of FDI within the countries.

Manufacturing industry has been an important target of FDI in most candidate countries attracting nearly half of the inward FDI stock as of end-2000 (exceptions are the Baltic states and no data are presented for Bulgaria and Romania in Table 6.1). The sectoral distribution of FDI is highly uneven, reflecting the varying attractiveness of individual branches for foreign investors as well as differences in the privatization policies pursued by the individual candidate countries (see Hunya, 2000). Generally FDI inflows have been high in both the domestically oriented food, beverages and tobacco industry (DA) especially in the Czech Republic, Hungary, Poland, Slovakia, Latvia and Lithuania, in some natural resource-based industries such as non-metallic mineral products (DI), as well as in export-oriented branches such as electrical, optical (DL) and transport equipment (DM) industries.

Table 6.1

Foreign direct investment (FDI) stock in manufacturing industry, 2000

USD million

NACE	Activities	Czech Republic[1)]	Hungary	Poland	Slovak Republic	Slovenia	Estonia	Latvia	Lithuania
DA	Food products; beverages and tobacco	1125.6	918.4	4961.9	229.0	38.5	128.2	100.2	269.3
DB	Textiles and textile products	203.6	142.6	254.4	20.6	12.7	78.6	32.5	108.6
DC	Leather and leather products	4.1	22.8	17.2	15.3	12.4	.	1.8	0.3
DD	Wood and wood products	89.7	40.4	240	17.1	5.6	93.6[3)]	57.9	33.0
DE	Pulp, paper & paper products, publishing & printing	587.7	159.4	1470.3	105.9	191.6	.	17.9	25.2
DF	Coke, refined petroleum products & nuclear fuel	210.9	515.9[2)]	.	151.6	.	6.0	0.0	42.8
DG	Chemicals, chemical products and man-made fibres	398.0		1285.1	117.1	173.2	49.6	38.1	.
DH	Rubber and plastic products	104.2	176.7	591.4	21.3	141.4	6.3	10.5	26.7
DI	Other non-metallic mineral products	1467.8	233.6	2785.7	97.9	73.3	.	23.7	37.6
DJ	Basic metals and fabricated metal products	624.2	194.6	403.4	819.2	88.5	22.3	25.7	11.6
DK	Machinery and equipment n.e.c.	218.7	199.1	317.1	80.4	144.7	18.5	21.5	7.4
DL	Electrical and optical equipment	662.2	680.6	1575.1	80.0	122.4	16.6	5.9	53.0
DM	Transport equipment	989.5	366.0	5167.7	122.3	133.9	39.1	1.3	48.1
DN	Manufacturing n.e.c.	100.5	38.3	393.5	7.8	4.5	.	8.1	7.9
D	**Manufacturing**	**6786.7**	**3688.4**	**19462.8**	**1885.4**	**1142.7**	**567.7**	**345.0**	**671.5**
	FDI total	**17552.1**	**10104.0**	**45772.0**	**3692.2**	**2808.5**	**2645.4**	**2081.3**	**2334.3**

Notes: 1) 1999. - 2) Includes DF+DG. - 3) Includes DD+DE.

Remarks: Czech Republic: equity capital, reinvested earnings, loans.
Hungary: nominal capital based on corporation-tax declarations.
Poland: equity capital, reinvested earnings gross; projects over USD 1 million capital based on PAIZ data.
Slovak Republic: equity capital, reinvested earnings - in the corporate sector.
Slovenia: equity capital, reinvested earnings, loans.
Estonia: equity capital, reinvested earnings, loans.
Latvia: equity capital, reinvested earnings, loans.
Lithuania: equity capital, reinvested earnings, loans.
Croatia: equity capital.

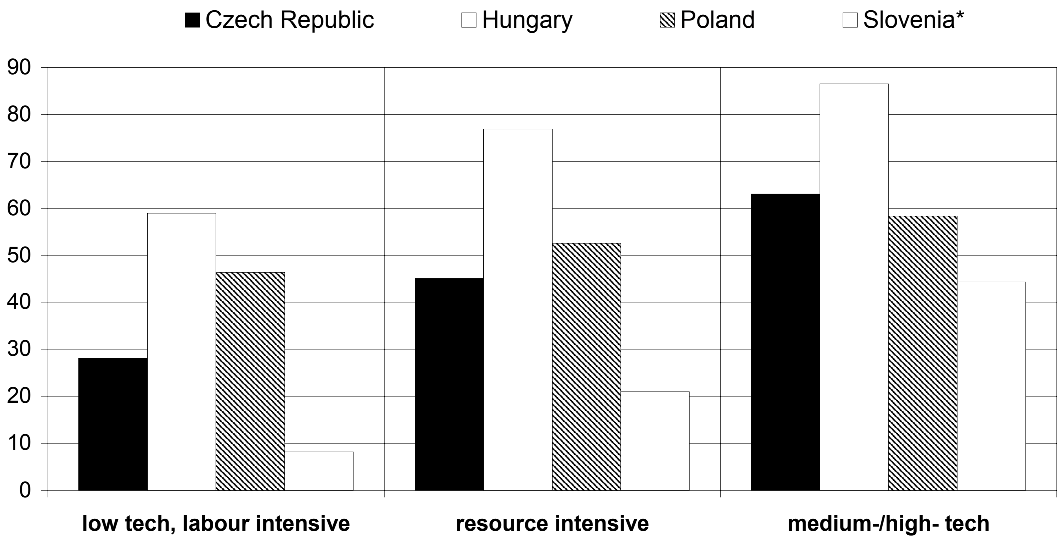
Source: National banks, Statistical Offices and Foreign Investment Agencies.

Using again our previous classification into low-tech, medium-/high-tech, and resource-intensive industries and looking at the shares of sales from FIEs (enterprises with some degree of foreign ownership; for details on this database see Hunya, 2002) in total industry sales, we can see that in all four countries depicted in Figure 6.1 the FIEs account for a higher share of sales in the medium-/high-tech than in the low-tech or the resource-intensive branches. This is quite consistent with the picture of structural change and trade specialization depicted for the more advanced of the CEECs in the previous sections of this paper.

Figure 6.1

The share of FIEs in different industry groupings

1999 in %



* Slovenia without tobacco.

Overall, there are two points we want to make with regard to FDI:

- The presence of FDI across CEECs remains very uneven and hence the role it can perform in facilitating the up-grading of the CEECs' industrial structures will actually be performed to different degrees. This is compatible with a picture of differentiated catching-up patterns across the CEECs as pointed out in the previous sections of the report.
- The distribution of FDI across branches (although this point needs further elaboration which will not be undertaken in this paper) indicates that FDI is attracted also to branches which can be classified as medium-/high-tech and thus plays a role in the productivity and quality up-grading process in these branches (for further evidence on the impact of foreign ownership involvement in further productivity improvements and export performance in CEECs, see Hunya, 2002).

7 The role of educational attainment and labour market developments with regard to different skill groups

It is well known that the large cumulative employment drops in the CEE region since 1989 has been reflected in falling labour force participation rates in all CEECs. A comparison between the transition countries covered here and the EU-15 shows that, despite these considerable falls, participation rates are still 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 show 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%. Furthermore, the gender gap in employment rates remained smaller in the CEECs compared to most countries in the EU. Unemployment rates amounted to between 9% and 19% in the CEECs by the year 1999 which reflects the development of the labour force (particularly the participation rate) on the one hand and that of employment levels on the other. Unemployment rates across the region have reached a range not dissimilar to the EU in the early 1990s.

The labour market structure of the accession countries with respect to skill levels and educational attainment must be seen against the background of these changes in participation rates. A first glance at comparable data across CEECs and a comparison with EU Northern and EU Southern economies reveals high shares of upper secondary education (see Table 7.1).

The data presented in Table 7.1 were collected from national labour force surveys and compared to data for European countries reported in European Commission (2001). Although there are methodological difficulties these data provide a rough overview of the structure of educational attainment.

Table 7.1 shows that most countries have a share of lower upper secondary educational levels in the working-age population of about 30% (lowest in the Czech Republic with 24%) which is at more or less the same level as for the EU Northern countries. Higher shares are only reported for Bulgaria and Romania with more than 40%. This can be compared to the EU Southern countries which show a share of almost 60%. With respect to the other aggregates the Central and Eastern European countries have on average higher shares of upper secondary and much lower shares in tertiary education than the EU Northern and even slightly lower shares in tertiary education than the EU Southern countries.

Table 7.1

Educational shares

		Czech Republic	Hungary	Poland	Slovenia	Slovak Republic	Estonia	Latvia	Lithuania	Bulgaria	Romania	EU-South	EU-North
Population													
Age group 15-64 by education													
< upper secondary	**%**	23.8	38.5	33.1	33.9	28.8	26.2	30.6	31.3	43.9	43.2	58.0	28.6
upper secondary	**%**	67.0	50.3	58.3	53.9	63.5	51.3	55.3	36.8	42.7	49.9	29.2	49.5
Tertiary	**%**	9.1	11.2	8.6	12.1	7.6	22.5	14.1	31.9	13.4	6.9	12.8	21.9
Labour force													
Age group 15+ by education													
< upper secondary	**%**	10.4	18.4	15.8	20.7	9.4	12.4	13.8	12.4	22.9	35.7	54.9	23.5
upper secondary	**%**	77.8	65.4	71.9	62.8	80.0	58.5	66.7	44.9	56.8	55.9	28.3	51.6
Tertiary	**%**	11.8	16.2	12.3	16.5	10.6	29.1	19.4	42.6	20.3	8.4	16.8	24.9
Employment													
Age group 15+ by education													
< upper secondary	**%**	8.8	17.4	14.8	19.9	6.9	10.7	12.7	11.4	19.2	36.8	54.7	22.3
upper secondary	**%**	78.7	65.5	71.3	62.8	80.7	57.4	66.3	42.6	57.7	54.4	28.2	51.8
Tertiary	**%**	12.6	17.1	13.9	17.3	12.4	31.8	21.0	45.9	23.1	8.7	17.1	25.9
Unemployment													
Age group 15+ by education													
< upper secondary	**%**	26.7	32.4	20.8	31.9	19.8	23.9	20.8	18.0	39.0	20.0	56.1	38.0
upper secondary	**%**	69.2	64.1	75.0	62.9	77.2	65.1	69.5	57.4	53.0	75.6	29.5	48.7
Tertiary	**%**	4.1	3.5	4.2	5.3	2.9	11.0	9.8	24.6	7.9	4.4	14.4	13.3

Source: Employment and labour market in Central European countries, European Commission, 2001 and own calculations.

However, the shares of different educational groupings in the labour force and in employment can differ from those in (working-age) population as participation rates differ across countries and educational levels. Whereas the relative shares between population, labour force and employment across the different educational groups corresponds roughly for the EU Southern and EU Northern countries, there are bigger differences in relation to the Central and Eastern European countries. The share of lower upper secondary educational levels in the labour force and in employment is in most cases much below the share in total population which reveals a very low participation rate. Correspondingly the relative shares of people with upper secondary education and tertiary education in the labour force and in employment are relatively higher.

The skill structure of unemployment similarly reflects this picture and also differs from the EU Northern and EU Southern countries. People with upper secondary educational levels amount to about 60% to 70% of unemployed compared to 30% in EU-South and 50% in EU-North. On the other hand the share of people with lower upper secondary level is lower (the reason might be the lower participation rate) whereas the share for people with tertiary education is much lower. Unemployment rates are particularly low amongst the persons with tertiary education, even in comparison with the EU Southern and EU Northern countries. This points towards a structural problem, i.e. the lack of highly-skilled workers/employees. However, these data mask further severe deficiencies with respect to particular occupations. E.g. the EBRD (2000) reports a lack of skills especially in managerial and other high-skilled employment which corresponds to the relatively low shares in tertiary education.

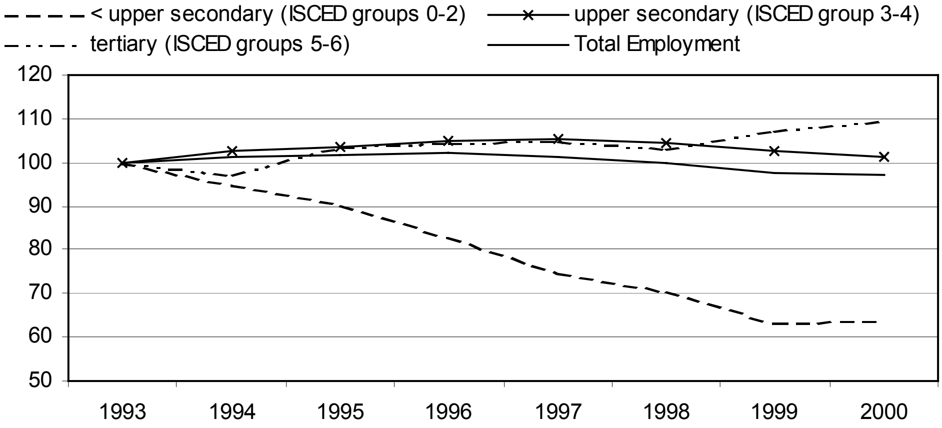
Figures 7.1 show the evolution of employment levels by skill groupings (ISCED classification) for six of the CEE candidate countries. The compilation of this dataset from national labour force surveys was laborious and the data series have different starting points as the compilation of LFS data started at different dates in the different economies. The uniform picture which emerges is that there were strong negative employment developments in the lowest skill categories while there were positive labour market pressures for the higher skill groupings (mostly those with tertiary education, in some countries those with upper secondary educational levels).

Although the above definitely requires much more detailed analysis, the evidence obtained with regard to strong labour demand pressures for the highly skilled in the transition countries is consistent with the picture of a catching-up process with qualitative up-grading which has been developed in the earlier sections of this paper.

Figure 7.1

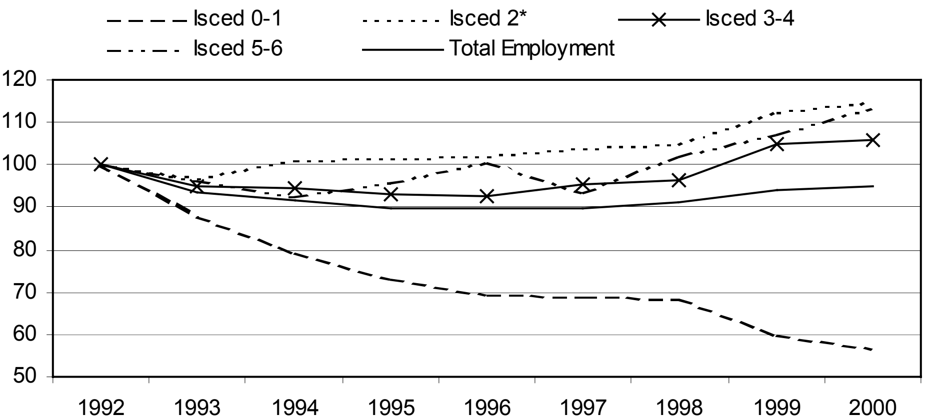
Czech Republic: Changes of employment in skill categories

(Index: 1993 = 100)



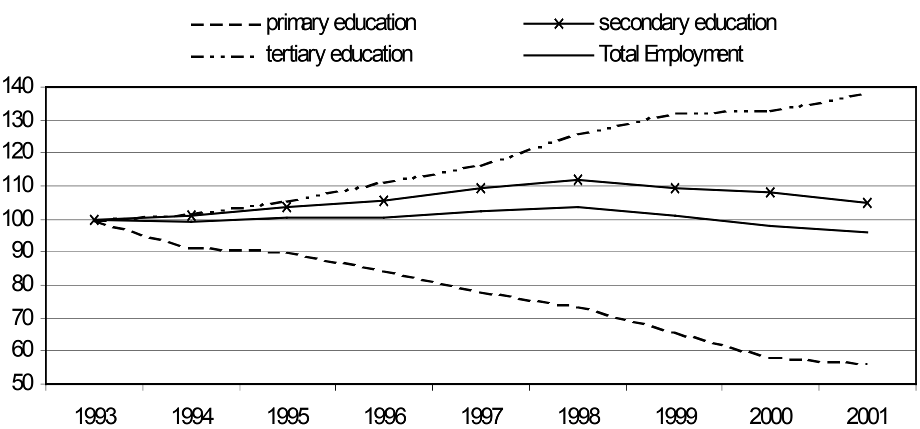
Hungary: Changes of employment in skill categories

(Index: 1992 = 100)



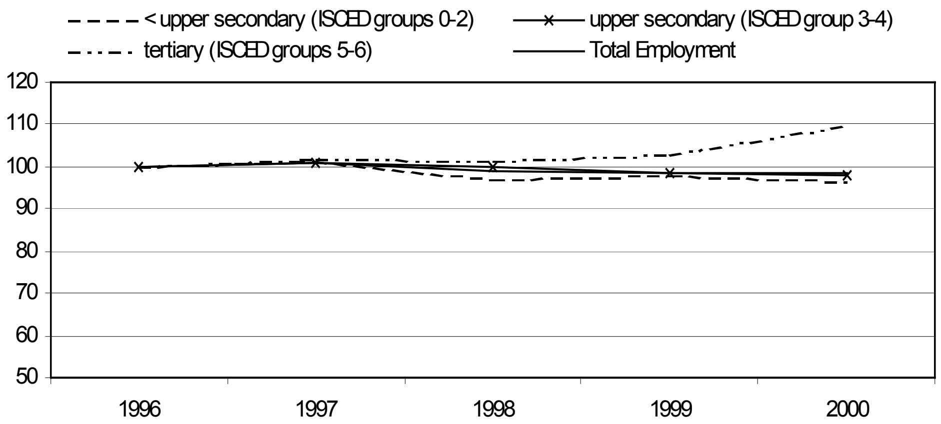
Poland: Changes of employment in skill categories

(Index: 1993 = 100)



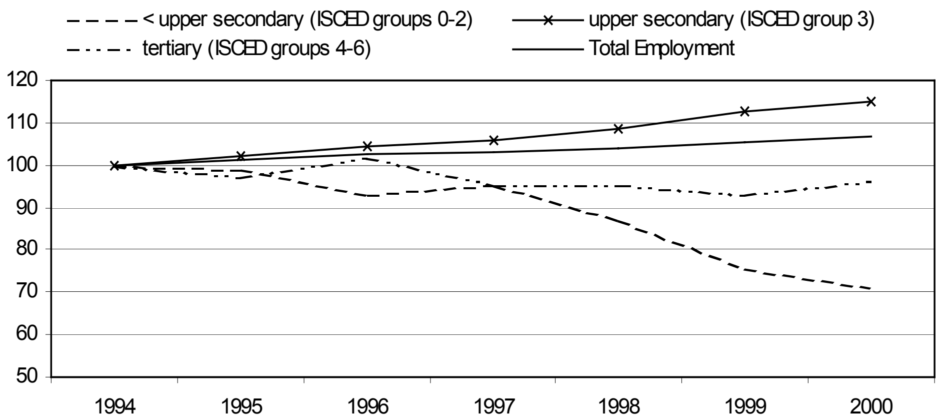
Romania: Changes of employment in skill categories

(Index: 1996 = 100)



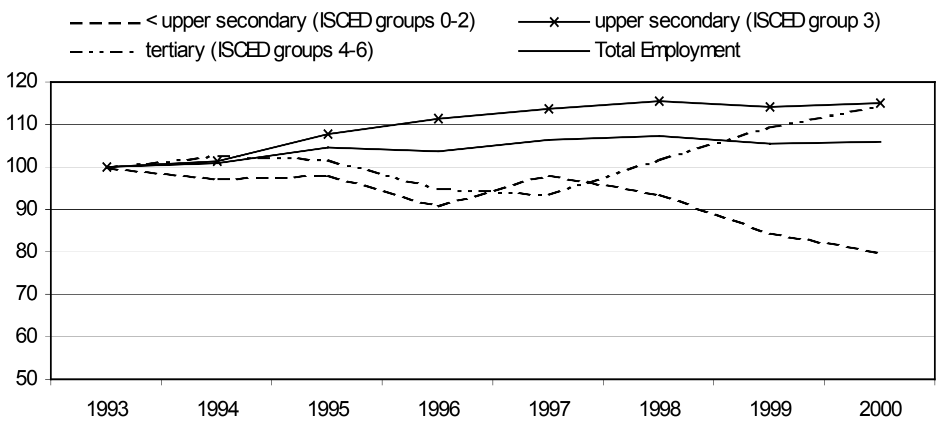
Slovak Republic: Changes of employment in skill categories

(Index: 1994 = 100)



Slovenia: Changes of employment in skill categories

(Index: 1993 = 100)



8 Summary

This paper has attempted to analyse the evolving patterns of industrial specialization in Central and Eastern Europe. We have shown that a differentiated picture emerges, with some countries catching up relatively fast in technologically more sophisticated branches and also improving their positions in intra-branch product quality. This picture is compatible with an analytical approach in which the potential exists to turn comparative advantages in favour of those areas in which initially bigger gaps (in productivity and product quality) exist. This is an application of the Gerschenkron hypothesis ('advantage of backwardness') at the industrial level. However, the existence of such a potential does not automatically imply its utilization (a point which Abramovitz emphasized). The approach makes room for a wide diversity of qualitative catching-up patterns and evolving positions of catching-up economies in the international division of labour. This is what we observe with respect to the countries in Central and Eastern Europe where one set of countries got (so far) 'locked in' in a rather traditional pattern of trade and industrial specialization (in low-skill, labour-intensive branches), while other CEECs (to varying degrees) show a much more dynamic pattern of integration into the European division of labour.

We have substantiated this picture of diversity by analysing first the broad patterns of structural change in Central and Eastern Europe (section 2) and then the changes in employment and production structures within manufacturing (section 3). We then moved towards examining the evidence for a dynamically evolving structure of comparative advantage with a detailed assessment of differential patterns of productivity and unit (labour) cost growth across branches (section 4) and with an analysis of inter-industry trade specialization and differential (export) product quality up-grading within industrial branches (section 5). Finally, we sketched the roles of foreign direct investment (section 6) and of the existence and utilization of educational attainment (section 7) as important factors in determining the positions of individual countries (the analysis could similarly be extended to regions) in the evolving division of labour in the European economy as a whole. We could show that the picture concerning labour demand for different skill groups supports our analysis with respect to the up-grading of industrial structures in the more advanced of the CEE candidate countries.

As regards EU enlargement our analysis shows clearly that different CEECs are in different positions with regard to their achieved levels of catching-up, and this refers not only to overall levels but – probably more importantly – to the qualitative nature of their structural transformations and their positions in cross-European trade structures. We expect such differentiation to have a bearing on how they will cope with the additional adjustments required by the accession process itself and on what footing they will be able to participate in the integrated structures of the enlarged European economy. This, of course, also has implications for the instruments which will be required to deal with the problems of cohesion which will get further accentuated not only as a result of the accession process itself but as a result of the existence of a set of other economies which are highly integrated with the EU but will not join in the first round.

Differentiation across regions shows a similar picture of differentiation across countries (see Fazekas, 2002). Again, some regions are catching up in terms of industrial up-grading, they are very successful in attracting FDI which accounts for a large share of overall exports, while other regions remain 'locked in' in low-skill areas of production, with low shares of well-educated personnel and little evidence for up-grading. Regional differentiation constitutes thus a great challenge for cohesion policies in the candidate countries.

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APPENDIX

Table A.1

WIFO Taxonomies	**NACE rev. 1**	***Taxonomy I*** **factor inputs**	***Taxonomy II*** **labour skills**
Meat products	151	4	1
Fish and fish products	152	4	1
Fruits and vegetables	153	4	1
Vegetable and animal oils and fats	154	4	1
Dairy products; ice cream	155	4	1
Grain mill products and starches	156	4	1
Prepared animal feeds	157	4	1
Other food products	158	4	1
Beverages	159	4	1
Tobacco products	160	4	1
Textile fibres	171	3	1
Textile weaving	172	2	1
Made-up textile articles	174	2	1
Other textiles	175	1	1
Knitted and crocheted fabrics	176	1	1
Knitted and crocheted articles	177	1	1
Leather clothes	181	2	1
Other wearing apparel and accessories	182	2	1
Dressing and dyeing of fur; articles of fur	183	2	1
Tanning and dressing of leather	191	4	1
Luggage, handbags, saddlery and harness	192	4	1
Footwear	193	4	1
Sawmilling, planing and impregnation of wood	201	2	2
Panels and boards of wood	202	2	2
Builders' carpentry and joinery	203	2	2
Wooden containers	204	2	2
Other products of wood; articles of cork, etc.	205	2	2
Pulp, paper and paperboard	211	3	3
Articles of paper and paperboard	212	1	3
Publishing	221	4	3
Printing	222	4	3
Coke oven products	231		
Refined petroleum and nuclear fuel	232	3	3
Nuclear fuel	233		
Basic chemicals	241	3	3
Pesticides, other agro-chemical products	242	5	3
Paints, coatings, printing ink	243	1	3
Pharmaceuticals	244	5	4
Detergents, cleaning and polishing, perfumes	245	4	3
Other chemical products	246	5	3
Man-made fibres	247	3	3
Rubber products	251	1	1
Plastic products	252	1	1
Glass and glass products	261	1	1
Ceramic goods	262	2	1
Ceramic tiles and flags	263	3	1
Bricks, tiles and construction products	264	2	1
Cement, lime and plaster	265	3	1
Articles of concrete, plaster and cement	266	1	1
Cutting, shaping, finishing of stone	267	2	1
Other non-metallic mineral products	268	1	1

(Table A.1 continued)

Table A.1 (continued)

WIFO Taxonomies	**NACE rev. 1**	***Taxonomy I*** **factor inputs**	***Taxonomy II*** **labour skills**
Basic iron and steel, ferro-alloys (ECSC)	271	3	1
Tubes	272	1	1
Other first processing of iron and steel	273	3	1
Basic precious and non-ferrous metals	274	3	1
Structural metal products	281	2	2
Tanks, reservoirs, central heating radiators and boilers	282	4	2
Steam generators	283	2	2
Cutlery, tools and general hardware	286	4	2
Other fabricated metal products	287	1	2
Machinery for production, use of mech. power	291	1	4
Other general purpose machinery	292	1	4
Agricultural and forestry machinery	293	1	4
Machine-tools	294	2	4
Other special purpose machinery	295	1	4
Weapons and ammunition	296	1	4
Domestic appliances n. e. c.	297	1	3
Office machinery and computers	300	5	4
Electric motors, generators and transformers	311	1	3
Electricity distribution and control apparatus	312	5	3
Isolated wire and cable	313	1	3
Accumulators, primary cells and primary batteries	314	1	3
Lighting equipment and electric lamps	315	1	3
Electrical equipment n. e. c.	316	2	3
Electronic valves and tubes, other electronic comp.	321	5	3
TV, and radio transmitters, apparatus for line telephony	322	5	3
TV, radio and recording apparatus	323	5	3
Medical equipment	331	5	3
Instruments for measuring, checking, testing, navigating	332	5	3
Optical instruments and photographic equipment	334	5	3
Watches and clocks	335	4	3
Motor vehicles	341	5	2
Bodies for motor vehicles, trailers	342	2	2
Parts and accessories for motor vehicles	343	3	2
Ships and boats	351	2	2
Railway locomotives and rolling stock	352	2	2
Aircraft and spacecraft	353	5	4
Motorcycles and bicycles	354	1	2
Other transport equipment n. e. c.	355	1	2
Furniture	361	2	2
Jewellery and related articles	362	2	2
Musical instruments	363	4	2
Sports goods	364	4	2
Games and toys	365	4	2
Miscellaneous manufacturing n. e. c.	366	4	2

	Taxonomy I :	**Taxonomy II :**
Industry clusters:	1. Mainstream	1. Low-skill industries
	2. Labour-intensive industries	2. Medium-skill/blue-collar workers
	3. Capital-intensive industries	3. Medium-skill/white-collar workers
	4. Marketing-driven industries	4. High-skill industries
	5. Technology-driven industries	

Source: M. Peneder (2001), *Entrepreneurial Competition and Industrial Location*, Edward Elgar, Cheltenham, UK.