

The Productivity Gap between East and West Europe: What Role for Sectoral Structures during Integration?

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Abstract:

Analysis into the sources of lower levels of national productivities between Central East European Economies and the European Union is scarce and lacks comparability.

These sources are assessed by analysing the role played by sectoral structures. After providing a brief overview over comparative levels of economy-wide labour productivity between the EU-15 average, selected EU cohesion countries and the EU accession countries of Estonia, Poland, the Czech and Slovak Republics, Hungary and Slovenia, a quantitative account of the sectoral content of the national productivity gap is calculated. The paper develops a method to calculate the explanatory power of patterns of sectoral structures for the size of the productivity gap by hypothetically applying average EU-15 sectoral patterns on Central East European economies' sectoral productivities. Subsequently, the respective roles of individual sectors in explaining the national productivity gaps are being calculated by attaching weights to sectoral productivity gaps relative to their employment shares.

These results are then carefully assessed in terms of potentials and prospects for a swift and complete productivity catch-up and in terms of the most efficient policies to assist productivity convergence.

Keywords: Transition economies, economic development, productivity gap, EU cohesion policies, integration theory, sectoral patterns, specialisation patterns

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Introduction

Since the outset of systemic transformation, Central East European countries (CEECs) have achieved a profound level of real economy integration with Western European countries. Some transition economies can expect to participate in the European Single Market in a few years time. Levels of economic development in accession candidates are still much lower than the average EU-15 level most probably granting them access to EU Structural and Cohesion Fund policies.

The reasons explaining lower levels of economic development not only lie with technological backwardness, institutional, managerial and organisational deficiencies but are also rooted in the sectoral specialisation patterns of the economies. Sectoral structures play a relevant role in a framework of economic catch-up development via integration: first, the pattern of sectoral specialisation can explain some of the lower levels of economic development, measured here as productivity gaps *vis-à-vis* the EU-average. Second, assuming some degree of path dependency in sectoral patterns, the emerging international division of labour can limit the scope for complete catch-up: as integration deepens, technology and skills in CEECs will improve, institutions will be reformed to match the ones in the EU (via the *acquis communautaire*) but sectoral structures might remain rigid and limit real economy convergence.

Assuming that deepening integration with the West and eventual EU membership does not necessarily have to lead to complete economic convergence in all accession countries, the aim of this paper is to determine the prospects of economic catch-up for a selection of accession countries and to assess the scope for economic policy to assist improving the conditions for economic development. This is not to deny that integration generally is a necessary condition for catch-up development in transitional CEECs via technology transfer and efficiency-improving participation in intra-industrial trade and/or specialisation. Rather, integration might prove to be insufficient. In its latest report on economic cohesion, the EU Commission takes the opinion that sectoral structures in candidate countries will prove to be decisive in a process of real economy convergence (EU 2001b, pp. 37-41). The report suggests to target EU cohesion policies towards the intermediate aim of structural change.

The approach used in this analysis is methodologically more deterministic than most related research into the structural development in CEECs (e.g. Gács 2001¹). An

¹ Here, structural patterns are compared to the ones prevailing prior to systemic change and the ones prevailing in the EU today. The analysis does not determine what patterns or what direction or what intensity of change is normatively better or worse for the process of economic catch-up.

example for research providing a normative account for sectoral structures by use of the Clark-concept of a close correlation between *per capita* GDP levels and sectoral specialisation patterns is Döhrn/Heilemann 1991, 1993. Here, sectoral differences determine the intensity and direction of future sectoral adjustment.

The selection of accession countries includes in geographical order Estonia, Poland, the Czech and Slovak Republics, Hungary and Slovenia. These countries appear to be amongst the most likely transition economy candidates for EU membership in the coming years. The period of analysis starts 1995 (by then, the most profound structural breaks in prices and the allocation of employment have already occurred) and ends 1999 with the latest comparative data available for all countries assessed. For empirical reasons, this paper assesses labour productivity and disregards the productivities of other factors of production, as *e.g.* capital. Moreover, the most profound modernisation of capital stock is still under way, making year-on-year comparisons difficult. This is not to neglect that an analysis of capital productivity and total factor productivity could lead to slightly different results and that such will gain more importance with transition countries reaching higher levels of economic and technological development.

The paper first provides a brief overview over comparative levels of national productivities between the EU-average, selected EU cohesion countries and accession countries. The focus of the analysis is on the role played by sectoral structures: first, an indicator is being developed to quantify the explanatory power of patterns of sectoral structures for the size of the productivity gap. Following from there, the respective roles of individual sectors in explaining the national productivity gaps are being calculated. These results are carefully assessed in terms of potentials and prospects for a swift and complete productivity catch-up and in terms of the most efficient policies to assist productivity convergence.

1 The stylised facts - the observed productivity gap

Within the past decade, national levels of labour productivity in CEECs (in the following: 'productivity levels') have converged significantly towards the levels predominant in the EU. Yet, levels are still significantly lower, large gaps are still prevalent. Needless to say, levels within the EU also differ greatly; comparisons with the EU as an economic area use the weighted average of all current 15 EU member states.

Table 1 reports levels in 1000€ for the year 1999, calculated by use of annual average market exchange rates as well as PPP-corrected exchange rates (shaded columns). All countries reported have lower living expenses than the EU-15 average (measured in

terms of living expenses), hence the significantly higher figures for PPP-adjusted levels.² In 1999, three groups of countries amongst CEECs with similar productivity levels can be identified: Estonia and Poland rank in a lowest productivity group, the Slovak and Czech Republics as well as Hungary in a second and Slovenia sticks out as the country with the highest productivity level. At the outset of economic transformation and integration into western markets, productivity levels were not only much lower but also more diverse. Slovenia had always achieved higher productivity levels even during its socialist era; the gap to its fellow accession candidates has even further increased. Throughout the 1990s, productivity levels of Hungary and the Czech Republic were more or less the same, albeit Hungary growing at a slightly faster rate. Ever since the break-up of the CSFR remained the Slovak Republic's productivity level slightly lower than the ones of the Czech Republic and Hungary. Estonia started from a low level but managed to overtake Poland in 1997.

Table 1 Productivity levels in the EU and CEECs, in end 1999

	Market exchange rates	PPP-exchange rates	
	in 1000 €/per employment		in % of EU-15
EU-15	41.8	41.8	100.0
East Germany	36.0	36.9	88.3
Portugal	9.8	15.1	36.1
Greece	18.4	23.7	56.7
Spain	26.1	31.9	76.3
Estonia	7.6	17.8	42.6
Poland	8.2	17.4	41.6
Czech Republic	9.8	24.0	57.4
Slovak Republic	8.3	22.6	54.1
Hungary	10.2	23.9	57.2
Slovenia	19.5	29.9	71.5

Note: Aggregate, economy-wide productivity levels calculated as aggregate value added per employment.

Source: EUROSTAT, WIIW, National Statistical Offices, own calculations.

All transition economies in our sample exhibit sizeable productivity gaps *vis-à-vis* the EU-average and most of the 15 European economies (last row of the table). All of them have already surpassed Portugal, the EU member country with the lowest national

² For the purpose of international comparison, such PPP-correction is advisable. This, however, must not be confused with the concept of the purchasing-power parity theory but is purely a method to improve comparability and is used throughout the literature. In the case of the EU, the EUROSTAT Power Purchasing Standard has been applied; for the CEECs, the PPP-estimates of WIIW were used.

productivity level. Only three, the Czech Republic, Hungary and Slovenia, command higher levels than Greece, the second but weakest EU member country. In comparison to the average EU-15 level in end 1999, Slovenia reaches more than 70%, Hungary, the Czech and Slovak Republics more than 55% and Poland and Estonia more than 40%.

Of particular interest is the comparison of CEECs with East Germany. In effect also a transition economy, East Germany was integrated into the EMS and the currency-area of the West German DM already in 1990. Moreover, East Germany was integrated into the German *Länderfinanzausgleich*, a system of re-distribution of revenues to support weaker *Länder* on the cost of more prosperous ones. The country (or rather region) therefore gained access to a stable currency, a stable institutional framework and vast financial resources for investment and restructuring, all of which was not available in fellow transition countries. East Germany was able to nearly close up to the EU-15 productivity level within only a few years while catch-up in fellow transition countries is generally expected to take many more years: in the latest EU report on accession countries (EU 2001a), it is assumed that Poland will converge to 75% of the average EU-15 level in only 33 years, Slovakia in 20, Estonia in 19, the Czech Republic in 15, Hungary in 11 and Slovenia in as little as 1 year.

2 Sectoral determinants of the productivity gap

Reasons explaining the significantly lower levels of productivity in CEECs relative to most EU economies are manifold and include lower levels of technology, a less developed institutional framework, lower intensity and quality of organisational as well as management expertise and patterns of specialisation in the international (mainly European) division of labour.³

Intuitively, the productivity gap between CEECs and the EU predominantly reflects the fact that the transition economies command less sophisticated technologies, in quantity and/or in quality. Indeed, there can be little doubt that firms in CEE on average apply less or lower levels of technology as compared to the West and hence exhibit lower levels of productive efficiency in the use of factors at firm level. Nevertheless, there will already exist individual firms which, by having invested into the latest technology or have benefited from the transfer of the latest technology from the West, can even

³ In this respect, a three-year research project concentrating on the same sample of countries and their determinants of the productivity gap relative to the EU assesses all those reasons. The project is co-ordinated at the IWH. Results and proceedings will be made available to the academic community on the project web-page at the IWH: www.iwh-halle.de/projects/productivity-gap.

outpace comparable firms in the West in terms of productivity. Technology levels or even technological development in CEECs are very difficult to grasp in terms of empirical analysis⁴ directly. The focus of this paper is on sectoral structures: first, the sectoral analysis presented here identifies the extent to which national productivity gaps are rooted exclusively in sectoral specialisation patterns. If such patterns reflect comparative advantages, *i.e.* if some degree of path dependency can be assumed, then those results will give account of the extent of future productivity convergence to be expected in each accession candidate. Second, structural analysis yields a quantitative account of the respective roles played by individual sectors in determining the national productivity gap and its development. Such insight is indispensable when assessing efficiency of economic policy-options geared towards assisting a swift convergence of levels of national productivity according to the cohesion-approach taken by the EU Commission (see EU 2001b).

2.1 Specialisation and the sectoral content of the productivity gap

Transformational recession and restructuring with its associated historically unprecedented decline in industries, as well as the high employment shares of agriculture and lower shares in services in CEECs suggest that some of the productivity gap is rooted in the sectoral patterns of transition economies. In the assessment of the EU Commission, most of the productivity gap can be explained by diverging structural specialisation patterns (EU 2001b). Gaps of average, national productivity levels between two countries can arise even if all respective sector-specific productivity levels are equal, *i.e.* even if technology levels have caught up and corresponding firms would be equally productive. One country achieves a higher level of productivity, if it has higher (employment) shares in sectors with intrinsically higher levels of sectoral productivity relative to other sectors. This is the essence of sectorally determined productivity gaps.

What is the extent to which the productivity gaps of individual CEECs *vis-à-vis* the EU-15 average are rooted in the respective sectoral patterns? The average, national productivity level p of a country is defined as the sum of each product of sectoral productivity levels p^i and employment shares a of sectors i :

$$p = \sum_i (p^i a^i) \quad (1)$$

⁴ Earlier attempts to calculate technological advance in CEECs by use of the *growth accounting* method, based on the estimation of a production function, proved to be insufficiently robust. Not least, available data for capital stocks from national statistical offices were at times dubious (refer to: Stephan 1999).

The productivity gap between an individual country in CEE and the average EU-15 level $\bar{p}_{CEE/EU}$ is then calculated as:

$$\bar{p}_{CEE/EU} = p_{EU} - p_{CEE} = \sum_i (p_{EU}^i a_{EU}^i) - \sum_i (p_{CEE}^i a_{CEE}^i) \quad (2)$$

The sectorally determined productivity gap $\bar{p}_{CEE/EU}^{Sectoral}$ can be quantified by comparing the actually observed productivity gap with a hypothetical gap which would emerge, if sectoral patterns between CEECs and the average EU-15 would be equal (note the use of EU-15 employment shares in the first term of the right side of equation 3.2).⁵

$$\bar{p}_{CEE/EU}^{Sectoral} = \bar{p}_{CEE/EU}^{Hypothetical} - \bar{p}_{CEE/EU}^{Observed} \quad (3.1)$$

$$\bar{p}_{CEE/EU}^{Sectoral} = \left(\sum_i (p_{EU}^i a_{EU}^i) - \sum_i (p_{CEE}^i a_{EU}^i) \right) - \left(\sum_i (p_{EU}^i a_{EU}^i) - \sum_i (p_{CEE}^i a_{CEE}^i) \right) \quad (3.2)$$

This sectoral productivity gap is then related to the total of the observed productivity gap to denote the percentage share of the sectoral content in the national productivity gap (equation 4):

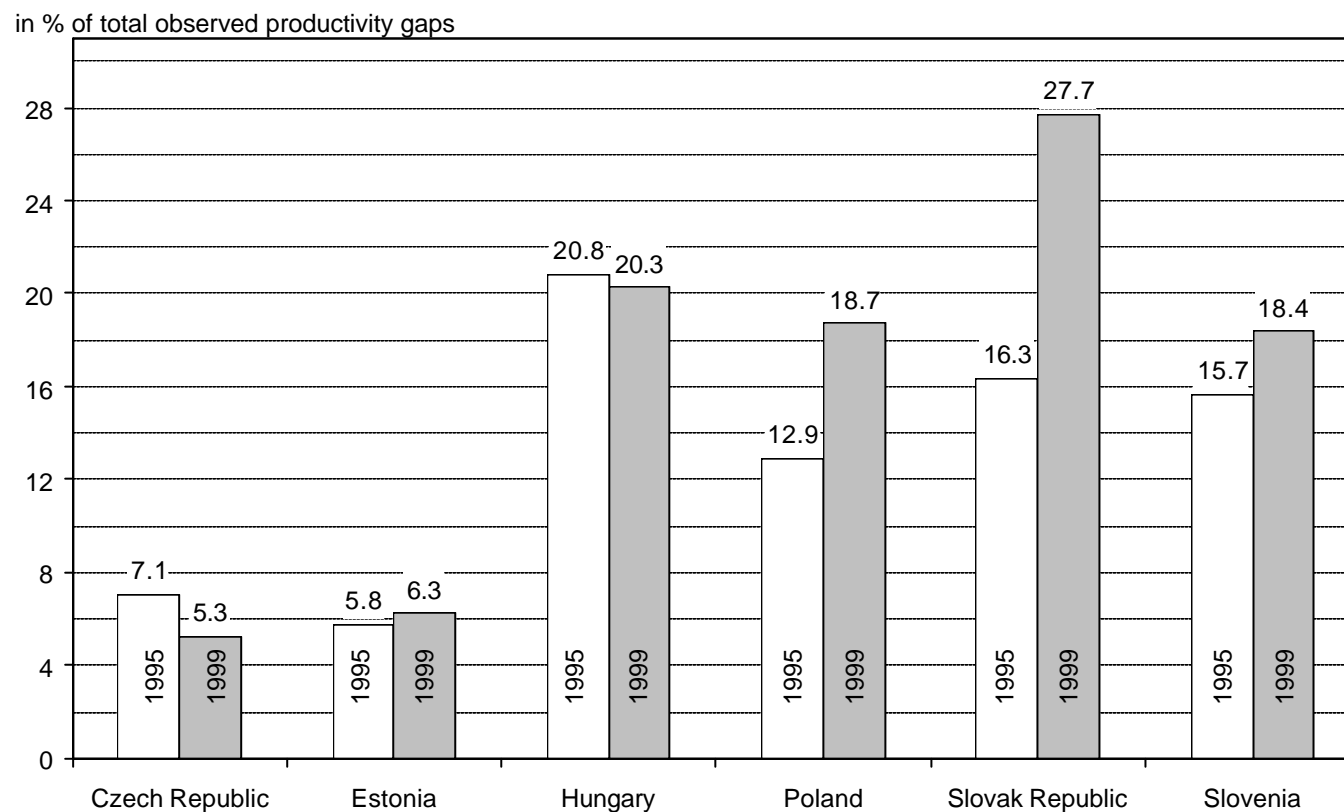
$$\hat{p}_{CEE/EU}^{Sectoral\ share} = \frac{\sum_i (p_{CEE}^i a_{EU}^i) - \sum_i (p_{CEE}^i a_{CEE}^i)}{\sum_i (p_{EU}^i a_{EU}^i) - \sum_i (p_{CEE}^i a_{CEE}^i)} \quad (4)$$

Chart 1 depicts the sectoral contents of the productivity gaps in observed total productivity gaps in 1995 and 1999, *i.e.* the extend to which the national productivity gaps are rooted in the respective patterns of specialisation.

The explanatory power of the sectoral structure for the size of the productivity gap is very different amongst the selection of transition economies and between the two years of observation: had the Slovak Republic had the same sectoral employment pattern as the economic region of the EU-15 in end 1999, then the productivity gap would have amounted to some 14 percentage points lower than is the case with the current pattern. The sectoral content of the Slovak Republic's productivity gap therefore amounts to a share of nearly 28% in the observed productivity gap. The gaps of Hungary, Poland and Slovenia in 1999 can also be explained to a large extent (around 20%) by their respective sectoral patterns whilst the sectoral determinant does not contribute significantly to explaining the productivity gaps of Estonia and the Czech Republic *vis-à-vis* the EU (some 5-6%). The result for the latter countries incidentally corresponds to

⁵ This is not to imply structural convergence in a normative manner of methodology. Rather, this method calculates a hypothetical level which will never be achieved given today's technology.

Chart 1 The sectoral contents of the national productivity gaps of CEECs, in 1995 and 1999



Sources: EUROSTAT, WIIW, National Statistical Offices, own calculations.

the sectoral content of the productivity gap between East and West Germany (IWH, 2000, p. 61). In the case of Poland, the results have to be interpreted with caution, most of the sectoral content calculated might be due to a particular empirical distortion in the agricultural employment share of nearly 28%.⁶ When assuming an agricultural employment share comparable to the methodology applied in other transition economies, *i.e.* a much lower share yet still significantly higher than in other transition economies, then the sectoral content would become negligible. Poland would then rank amongst the group with Estonia and the Czech Republic. The high sectoral content therefore is driven overwhelmingly by the large employment share in the agricultural sector.

What are the main driving sources of the sectoral content in the other countries? In the Slovak Republic, of enterprise-related services exhibit only one third of employment as compared to the EU-15. These have particularly high levels of intrinsic productivities: on average, they exhibit a level of productivity of nearly 4 times the national average in the Slovak Republic. The immense growth of the sectoral content between 1995 and 1999 cannot be explained by employment shifts between sectors only, employment shares did not change that much. Rather, sectoral productivities grew particularly fast in enterprise-related services, *i.e.* the sectors which drive the high level of the sectoral content. In the case of Hungary, the high share of the sectoral determinant of the productivity gap can be explained by, again a low share in enterprise-related services, and additionally much higher employment shares in the agriculture and industrial sectors. In particular the former sector exhibits well below-average productivities in Hungary. Since 1995, employment shares of enterprise-related services have grown slightly at the expense of the sector of public administration. Also in Slovenia can the high sectoral determinant mainly be accounted for by a low share of employment in enterprise-related services and a comparatively higher share in industry. This share however, has been falling slightly and the employment share of public administration has grown.

2.2 Sectoral structures and the prospects for real economy convergence

Integration theory remains undetermined in respect to evolving structural patterns and their effects on the conditions of economic development: one strand of theory assumes

⁶ Employment data in official Polish statistics distinguish less clearly between former occupation of unemployed persons and mere ownership of agricultural land. Already during the socialist era, a large share of agricultural land was owned privately. In particular during transformational recession and its sharp decline of industrial employment, many former industrial workers, having been laid off, tried to make a living by way of subsistence farming. In other transition economies, unemployed workers with an industrial employment history do not enter agricultural employment statistics.

that technological development is typically correlated with structural patterns. This is the essence of 'logistic growth path' concepts, the Clark-concept or the Chenery-Hypothesis, linking the level of economic development and sectoral productivities to sectoral structures and hence average, economy-wide productivity levels (concept first raised by Clark 1940, see *e.g.* Cornwall/Cornwall 1994, and in an application on transition economies: Döhm/Heilemann 1991, 1993 and Mickiewicz/Zalewska 2001). But this is typically a very long-term effect of gradually maturing market economies and exceeds the time-scope of analysis in this assessment. Still, eventually some sectoral convergence of CEECs to the structures of more advanced economies in the EU can be expected as a very long-term trend.⁷ In the shorter term, more relevant for the analysis here, the theory of comparative advantages predicts international specialisation emerging according to patterns of comparative advantages. In this case, evolving structures will persist for some time, giving rise to path dependency in the process of catch-up development. According to the factor-price-equalisation theorem, relative prices adjust in the process of specialisation to allow integrating partners to convergence in terms of *per capita* income. It remains disputable, however, whether the notion of factor-price-equalisation holds in reality; or at the very least, in what time-spans this equalisation will take effect. In reality, as this analysis could indicate, do structural differences go some way in explaining differences in levels of economic development - and in the short term, the explanatory power of structural differences can even grow in the process of intensifying integration. A further strand of theory works with the assumption that patterns of specialisation are not unidirectional, rather structural change or adjustment can make one or several detours (which not even prolong the time used for complete adjustment once income-levels have converged, the so-called 'turnpike-models').

The assumption, underlying this analysis, is that the development of sectoral patterns in the course of intensifying integration with the EU will exhibit some degree of path dependency. Sectoral patterns in CEECs to some extent reflect country-specific features which might not vanish swiftly or might even develop some hysteresis during the

⁷ Analysis enquiring whether CEECs converge towards sectoral and branch structures in the EU conclude that (a) sectoral patterns appear to converge in all transition economies observed here, with Slovenia and Estonia exhibiting the slowest structural convergence (Mickiewicz/Zalewska 2001, p. 20) and that (b) at a deeper level of disaggregation within manufacturing (2-digid NACE), Poland, the Czech and Slovak Republics and Slovenia exhibit falling structural deviation to the most advanced EU countries, whilst Hungary appears to converge neither towards the richer EU countries nor the EU-south patterns (Landesmann 2000, p. 26) and therefore could develop a distinctively complementary specialisation pattern in the international division of labour.

adjustment process: the development of human capital is a long-term process and a pattern of specialisation in the knowledge and skill-capital of an economy will not be subject to swift changes; investment in new capital will tend to reflect at least to some degree the field of activity, the technological level of sophistication, *etc.* predominant in the economy.

Given this assumption, the analysis yields another dimension: in the cases of the Slovak Republic, Poland and to a minor extent in Slovenia, the sectoral contents of productivity gaps have increased significantly. If such developments reflect patterns of specialisation emerging in the medium to long-term and if those patterns persist or even get more pronounced, then complete productivity convergence is inconceivable in those countries even after catch up of all other determinants of lower levels of productivity. With a sectoral content of the productivity gap of some 28% and a current productivity gap of some 46%, the Slovak Republic could experience some form of a 'barrier' to real convergence at a level of 87% of the EU-average even after *e.g.* technology had caught up completely to Western standards. Given her high level of unemployment, the country might not even be able to surpass the threshold of 75% of average EU-15 GDP *per capita* income in the medium term to qualify for EU Structural Fund policies, this only due to her specialisation patterns. In the case of Hungary, a similar result may also apply due to the high value of the sectoral content, albeit here, some minor reduction in the sectoral share of the productivity gap can be observed. Only in the cases of the Czech Republic and Estonia do sectoral specialisation patterns not appear to be of a convergence-limiting kind.

2.3 Sectoral productivity gaps: the role of individual sectors

So far, sectoral analysis was concerned with the sectoral content of the productivity gap across the whole economy. That is, the analysis took into consideration sectoral specialisation patterns while not assessing the levels of productivity of individual sectors. In the following, sectoral analysis focuses on sectoral productivity gaps and the respective role the sectors play in explaining the national productivity gap. Again, the comparison drawn is to the average EU-15 levels: the EU-average is not used as a 'technology frontier area' to assess potentials for productivity growth in individual sectors, but rather as a realistic benchmark to be achieved in terms of real economy convergence.

If CEECs apply in general less sophisticated technology in production, then one can expect that comparative sectors in CEECs exhibit lower levels of productivities than in the EU. Such sectoral productivity gaps are not only significantly different in size but also in their relative weights within each economy assessed. Individual sectoral

productivity gaps are defined according to the same method as the national productivity gaps (from formula 2):

$$\bar{p}_{CEE/EU}^i = p_{EU}^i - p_{CEE}^i = (p_{EU}^i a_{EU}^i) - (p_{CEE}^i a_{CEE}^i) \quad (5)$$

In order to provide a quantitative account of the role played by each sector in determining the national productivity gap, our analysis attaches respective weights in terms of employment shares to the sectoral productivity gaps. The indicator $\tilde{p}_{CEE/EU}^i$ denotes the percentage share of a sector as a source of the productivity gap.

$$\tilde{p}_{CEE/EU}^i = \frac{\bar{p}_{CEE/EU}^i}{\bar{p}_{CEE/EU}} = \frac{(p_{EU}^i a_{EU}^i) - (p_{CEE}^i a_{CEE}^i)}{\sum_i (p_{EU}^i a_{EU}^i) - \sum_i (p_{CEE}^i a_{CEE}^i)} \quad (6)$$

The first term in formula (6) calculates the sectoral productivity gap (as defined in formula 5) and its respective weight in total employment. This is then related to the average, economy-wide productivity gap to exhibit the relative explanatory power of sector i in explaining the national productivity gap (the sum of all $\tilde{p}_{CEE/EU}^i$ equals 100).

Table 2 provides an account of explanatory powers of individual sectors as a source of national productivity gaps for the selection of CEECs at the end of the year 1999. The most obvious result of this analysis is that in all transformation economies assessed, the producing sectors of industry (C+D+E) are mainly responsible for national productivity gaps: they exhibit the highest values of the indicator (solely in the case of Poland, the agricultural sector is the quantitatively strongest source of the national productivity gap⁸), owed to in particular the typically highest productivity gaps amongst all sectors in combination with their high relative weight in the economies.

The dominant role of the industrial sectors as a source of the productivity gap is particularly pronounced in the case of Slovenia, where over 50% of the national gap is caused by mining, manufacturing and electricity, gas and water supplies. Although the industrial sectors' productivity gap had diminished significantly (by almost 10 percentage points between 1995 and 1999), much smaller productivity gaps in other sectors and an exceptionally high employment share account for this dominant role. The Czech and Slovak Republics find nearly 40% of their national productivity gaps caused

⁸ Just as in the reasoning of the previous analysis in footnote 5, this result might be driven by a methodological difference in the treatment of unemployed land-owners as small-scale farmers. Again assuming a corrected employment share, the agricultural sector would be placed behind household-related services (trade, transport and communication) in the list. The industrial sectors would then advance to the top of the list just as in the other countries assessed.

Table 2 The ranking of most influential sectors as a source of the productivity gap, in end 1999

Estonia		Poland		Czech Republic		Slovak Republic		Hungary		Slovenia	
Sector	\tilde{p}^i	Sector	\tilde{p}^i	Sector	\tilde{p}^i	Sector	\tilde{p}^i	Sector	\tilde{p}^i	Sector	\tilde{p}^i
C+D+E	31.9	A+B	40.6	C+D+E	39.2	C+D+E	38.1	C+D+E	34.5	C+D+E	51.5
L - O	25.9	C+D+E	23.5	L - O	20.7	L - O	29.2	L - O	32.1	G+H+I	20.1
G+H+I	19.7	L - O	14.8	G+H+I	20.3	G+H+I	14.4	G+H+I	20.6	L - O	12.7
A+B	8.2	G+H+I	12.2	J+K	11.5	F	10.1	F	7.1	F	7.4
F	7.3	J+K	5.8	F	6.3	A+B	8.4	A+B	4.7	J+K	6.4
J+K	7.0	F	3.0	A+B	2.0	J+K	0.0	J+K	1.0	A+B	1.9

Note: Share of sectoral productivity gaps, weighted by employment shares, as a fraction of the sum of all weighted sectoral productivity gaps.

Classification of sectors according to ISIC, rev. 3 nomenclature, with: A+B...Agriculture, hunting, forestry and fishing; C+D+E...industrial sectors; F...construction; G+H+I...household-related services; J+K...enterprise-related services; L - O...public administration sectors (defence; social security; education; health, social work; private households with employed persons).

Source: EUROSTAT, WIIW, National Statistical Offices, own calculations.

by the industrial sector: in both countries, industrial productivity gaps remained by-and-large unchanged between 1995 and 1999. The lowest industry source for national productivity gaps are to be found in Hungary and Estonia, the latter exhibiting a more evenly distribution of sectoral sources in general. In both cases, the industrial sectors' productivity gap fell by some 5 percentage points during the period of analysis.

The public administration sector (L - O) ⁹, the second most important source of national productivity gaps in this sample, will tend to be inflated in terms of employment in formerly socialist economies. This overmanning can, however, be expected to diminish gradually in the course of restructuring of these sectors. In the case of Hungary, nearly equal shares can be allocated to this sector as to the industrial sectors¹⁰. In fact, the analysis would have ranked the public administration sector as the most important source for the national productivity gap up until 1997. The productivity gap of the service sector fell by 6 percentage points during 1995 to 1999 with the employment share remaining unchanged. The biggest drop in this sector's productivity gap was experienced by the Slovak Republic with 12 percentage points - here, the state-administration sector accounts for nearly 30 per cent of the national productivity gap.

The role played by household-related services (G+H+I) is probably more due to a price effect than a question of efficient allocation of resources. Typically, household-related services are not internationally tradable. With rising income and wealth, prices for such services will tend to increase, narrowing the sectoral productivity gap and the sector's role in the national productivity gap. Indeed, the sectoral productivity gap has narrowed significantly with Estonia having experienced the biggest drop of 15 percentage points and in the other accession countries by some 6-8 percentage points. Enterprise-related services (J+K) are to some extent tradable; in particular financial services are well integrated with the West. The intensity of competition is high, hence, productivity gaps are low. Prices for the non-tradable part of enterprise-related services (mainly to be found in real estate, renting and business activities, K) will tend to be lower due to the same reason as with household-related services and do not count as technology-intensive.

Given this assessment of results, the analysis indicates that in accession countries, potentials for a closure of the productivity gap today predominantly lie with efficiency-

⁹ The calculation of levels of productivity in the services sectors in general and the state administration sector in particular is methodologically problematic due to the determination of prices and output. Results therefore have to be interpreted with due care.

¹⁰ Hungary is the only transition economy within our sample to experience growth in the employment share of industry following de-industrialisation during transformational recession.

improvements in industry. Indeed, industrial productivity gaps have been falling during the period of analysis in Slovenia, Estonia and Hungary but not significantly in the Czech and Slovak Republics and Poland, *i.e.* productivity growth in industry did not significantly exceed productivity growth in the EU in the latter country group. Given the demonstrated dominant role of industry in real economy convergence, this result suggests that the greatest shortcomings in the respective growth paths are to be found here. In the cases of Hungary and the Slovak Republic, and to a lesser extent in all other accession countries, future productivity increases also depend to a high degree on a reduction of historical overmanning in public administration. Productivity gaps in this sector diminished in all accession countries; only in the case of the Czech Republic was this improvement negligible.

Not in all sectors have levels of sectoral productivities converged: significant *increases* in sectoral productivity gaps mainly occurred in the agricultural sectors of Hungary (10 percentage points), Poland (4.7) and the Slovak Republic (3.9). In all those countries, the employment share of agriculture has been falling slightly and can be expected to continue to fall, so that the role of this sector in determining the national productivity gap might also diminish slowly.

3 Summary and some economic policy considerations

EU accession countries in CEE exhibit levels of labour productivity which are lower than the EU-15 average; the most prosperous transition countries reach levels comparable to Greece and Spain, and productivity levels of all accession candidates in the sample exceed the level of Portugal, the weakest EU member state.

The analysis could provide ample evidence that structural patterns in the sectoral composition of economies assessed play a relevant role in Hungary, the Slovak Republic and Slovenia. In the Slovak Republic and to a lesser extent in Slovenia, the explanatory powers of sectoral specialisation patterns have even increased significantly. These results suggest that the prospects for complete real economy convergence could be evaluated less optimistically in those countries as compared to the Czech Republic and Estonia, if assumed that such structures prevail during a process of path dependent catch-up development in the medium term. In respect to economic policies geared towards assisting a swift process of economic catching up, the results would suggest that promoting technological development alone could prove to be insufficient in those countries. Rather, measures geared towards increasing the flexibility in the reallocation of production factors to promote sectoral change could be a decisive factor in Hungary, the Slovak Republic and Slovenia. Here, the opinion taken by the EU in its latest

cohesion report (EU 2001b) appears to be well founded. The assessment of Poland depends entirely on the view taken with respect to agricultural employment. If it were as high as quoted in national statistics, then complete real economy convergence would depend strongly on sectoral change reducing agricultural employment to the benefit of industry and services.

The analysis into the most important sectors determining the national productivity gaps established that the closure of the productivity gap lies in all accession candidates predominantly with efficiency-improvements in industrial sectors and in Hungary, the Slovak Republic and Estonia furthermore with a reduction of historically high employment in the public administration sector (*e.g.* the social security system). Here, future productivity increases depend to a high degree on a reduction of historical overmanning in public administration. This will largely depend on the ability of the governments to execute potentially socially painful reforms of the state administration and social systems: this might prove especially difficult in the case of Hungary, where the formally well developed social security system had been significantly downsized in the austerity programme of March 1995. It remains to be seen whether accession candidates are able to introduce reforms to their state administrations whilst retaining a socially acceptable level of social security.

Economic policy in CEECs could in general be most efficient in closing the productivity gap, if focussed on an upgrading of technology and organisation-efficiency in industry via technology transfer and indigenous research and development. Foreign direct investment, closer ties in production, innovation and marketing networks spreading across the West and accession countries, improvement of infrastructure as well as financial support and integration of firm-R&D and universities are the typical and well tested political measures in this field. Not least, such policies can also increase the flexibility of production factors to promote the kind of sectoral change that this analysis pointed out as necessary for complete productivity catch-up.

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