DETERMINANTS OF GROWTH IN THE CENTRAL AND EASTERN EUROPEAN EU MEMBER STATES - A PRODUCTION FUNCTION APPROACH

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CONTENTS

EXECUTIVE SUMMARY

At the beginning of the 1990s eight central and eastern European countries – the Czech Republic, Estonia, Latvia, Lithuania, Hungary, Poland, Slovenia and Slovakia (EU8) – entered a new political and economic era. The collapse of the communist bloc and centrally planned economic systems had paved the way to political and economic freedom and democracy. Since the beginning of the reforms undertaken, the EU8 countries had sought to become members of the European Union (EU). They achieved this goal in May 2004. Since then several EU8 countries have been included in the Exchange Rate Mechanism (ERM) II (Estonia, Latvia, Lithuania, Slovenia and Slovakia). Slovenia joined the euro area on 1 January 2007, and all EU8 countries are expected to follow as well but only as soon as they fulfil the convergence criteria specified in the Treaty establishing the European Community.

There is no doubt that the EU8 countries have come a long way since the late 1980s, but this is by no means the end of their "transition." Many challenges still lie ahead and the real convergence process is far from finished. Although living standards have improved considerably since the beginning of the transition period, the per capita income gap versus the average levels in the EU and euro area is still significant.

These developments raise many important questions regarding the current economic conditions in the EU8 countries and their growth prospects. Will the convergence of per capita income levels between the EU8 countries and the euro area (the "real convergence" process) continue, and if yes at what speed? What are key determinants of the catching-up process and what can be done to bolster it? These questions are very complex and can be addressed in a number of different ways. Answering them requires a general knowledge of both the theoretical and empirical growth literature and the specific characteristics of the EU8 countries.

A natural framework for many long-run analyses of economic growth is the traditional production function approach that links output with both the accumulation of labour and capital, and technological progress. This approach helps to distinguish the main components of growth. Against this background, the paper focuses on aspects related to labour market performance and capital investment. It looks mainly at recent labour market and investment developments and, against this background, highlights implications for future developments in the EU8 countries in these fields. Given the data limitations, problems with mapping theoretical concepts into real data, and the sometimes ambiguous results from the empirical growth literature, our analysis has mainly a stock-taking and qualitative character.

After the severe economic recession in the aftermath of the collapse of the centrally planned systems in the EU8 countries at the beginning of the 1990s, these countries embarked on a fast growth path. Their buoyant expansion was bolstered by structural and institutional reforms, macroeconomic stabilisation, the prospect of EU membership and actual accession to the EU in May 2004. Improvements in labour productivity, primarily attributable to total factor productivity (TFP) growth, were the main driver of the catching-up process. By contrast, labour utilisation deteriorated in most of the EU8 countries. This finding is broadly in line with the results of other studies and consistent with the expected effects of the far-reaching economic transformation that took place in the EU8 countries during the period covered in this paper.

Looking at the labour market situation in the EU8 countries, it emerges that the still ongoing process of sectoral transition from agriculture and industry to services has been accompanied by an increasing degree of mismatch between labour supply and job vacancies. The indicators presented on educational attainment confirm that the adaptability of the workforce has not been sufficient to meet the changed labour

requirements resulting from the rapid sectoral shift, i.e. the higher demand for skilled workers. This has already created labour market bottlenecks in some countries and sectors and, if not appropriately addressed, is likely to lead to increasing wage pressure and ultimately lower growth and real convergence.

As regards capital accumulation, since 1996 most EU8 countries have experienced increasing investment ratios, driven by improved profitability and favourable changes in the cost of capital. Favourable cost of capital developments have mainly reflected the effect of nominal convergence in the EU8 countries towards the euro area on the risk premium on long-term investments. In addition, banking sector reforms, including privatisation, have led to an increase in competition in the banking sectors of the EU8, putting further downward pressure on the cost of borrowing.

Looking at investment in human capital, the EU8 countries show a mixed picture. Some indicators of educational attainment (public expenditure on education and share of the labour force with at least secondary education) suggest a favourable situation for the EU8 countries relative to the euro area. However, other indicators – related to research input (research and development (R&D) spending as a percentage of GDP) and output (number of patent applications) suggest that the EU8 are substantially lagging behind the euro area (which itself needs to catch up with the world's technology leaders).

Overall, the prospects for a continued and reasonably fast real convergence process between the EU8 countries and the euro area are good. However, the continuation of the rapid progress made by many EU8 countries in the past cannot be taken for granted. In fact, in order to ensure that fast economic growth in the EU8 countries remains sustainable, it is crucial for these economies to take appropriate policy action. First it is important to recall that sound macroeconomic policies including credible monetary policy and appropriate fiscal policy

are essential to ensure the appropriate framework conditions for further growth and convergence. Second, they need to address structural labour market problems, in particular by reducing regional and skill mismatches. Third, they must make further efforts to improve the business environment, in order to ensure that the capital accumulation process continues and R&D investments increase. Many of the above-mentioned facets of growth-enhancing policy will also help to ensure a continued inflow of foreign direct investment (FDI), which in turn is expected to help accelerate the convergence process.

I INTRODUCTION

At the beginning of the 1990s eight central and eastern European countries – the Czech Republic, Estonia, Latvia, Lithuania, Hungary, Poland, Slovenia and Slovakia (EU8) – entered a new political and economic era.[1] The collapse of the communist bloc and centrally planned economic systems had paved the way to political and economic freedom and democracy. Since the beginning of the reforms undertaken, the EU8 countries had sought to become members of the European Union (EU). They achieved this goal in May 2004. Since then several EU8 countries have been included in the exchange rate mechanism (ERM) II (Estonia, Latvia, Lithuania, Slovenia and Slovakia) and Slovenia joined the euro area on 1 January 2007. All other EU8 countries are expected to join the euro area as well but only as soon as they fulfil the convergence criteria specified in the Treaty establishing the European Community.[2]

There is no doubt that the EU8 countries have come a long way since the late 1980s, but this is by no means the end of their "transition." Many challenges still lie ahead and the real convergence process, defined as the convergence of per capita income levels between the EU8 countries and the euro area, is far from finished.[3] Although living standards have improved considerably since the beginning of the transition period, the per capita income gap versus average levels in the EU and euro area is still significant.

These developments raise many important questions regarding the current economic conditions in the EU8 countries and their growth prospects. Will real convergence continue, and if yes at what speed? What are key determinants of the catching-up process and what can be done to bolster it? These questions are very complex and can be addressed in a number of different ways. Answering them requires a general knowledge of both the theoretical and empirical growth literature and the specific characteristics of the EU8 countries. Several authors have already tried to tackle some of these issues for selected or all the EU8

countries – for instance Doyle et al. (2001), European Commission (2004a), Lenain and Rawdanowicz (2004) and IMF (2006). This paper joins this discussion, seeking to analyse recent trends in real convergence and to infer the medium-term growth prospects of the EU8 countries.[4]

A natural framework for many long-run analyses of economic growth is the traditional production function that links output with both the accumulation of labour and capital, and technological progress. This approach helps to distinguish the main components of growth. Against this background, the paper focuses on aspects related to labour market performance and capital investment. It looks mainly at recent labour market and investment developments and, against this background, highlights implications for future developments in the EU8 countries in these fields. Given the data limitations, problems with mapping theoretical concepts into real data, and the sometimes ambiguous results from the empirical growth literature, our analysis has mainly a stock-taking and qualitative character.[5]

1   The country coverage of the project is limited to the new Member States from central and eastern Europe (EU8) that joined the EU in 2004. Given the significantly higher level of per capita income in the remaining EU Member States outside the euro area (Denmark, Cyprus, Malta, Sweden and the United Kingdom), real convergence is less important for these countries. Moreover, Cyprus and Malta did not undergo the transition process of the EU8 countries and are very small economies. This makes them less comparable with the EU8 countries and complicates a cross-country analysis. Given that the EU8 countries are expected to join the euro area (Slovenia has already done so), benchmarking the real convergence process to the euro area seems to be a natural course of action, although in some areas the euro area may not be the best performing economy.

2   For an overview of the EU8 countries' progress towards nominal convergence see ECB (2006a) and (2006b).

3   There are also other possible definitions of real convergence, such as the convergence of the sectoral structure of economies or the convergence of their institutions and legal frameworks. However, the convergence of per capita income levels is the most frequently used definition of the term "real convergence" in the economic literature.

4   For other ECB studies looking at the new EU Member States, see also Backé et al. (2004), Angeloni, Flad and Mongelli (2005), and Afonso, Schuknecht and Tanzi (2006).

5   Another very important aspect of the real convergence process is developments in financial markets. However, given that this study follows a production function approach, financial market developments are not discussed in detail. For a more in-depth overview of recent financial developments in central, eastern and south-eastern Europe see ECB (2006c).

The remainder of the paper is organised as follows. Section 2 starts with a short overview of the growth and real convergence experience of the EU8 countries since the mid-1990s and looks at the contributions of labour, capital and total factor productivity (TFP) to growth in per capita income. This provides a general background for the more detailed analyses of recent labour market and investment developments in Sections 3 and 4. Section 5 summarises the main findings and identifies key challenges for the EU8 countries with regard to their further real convergence processes.

2 RECENT PROGRESS WITH GROWTH AND REAL CONVERGENCE IN THE EU8

2.1 GENERAL BACKGROUND AND CONVERGENCE TRENDS IN THE EU8

Following the abrupt end of the centrally planned systems in central and eastern Europe in the late 1980s, output collapsed in most EU8 countries. Although data for the first half of the 1990s are mostly unreliable and should be treated with great caution, Table 1 indicates that output losses during 1991-95 differed significantly between countries and were largest in the Baltic States.

Table 1 Real GDP growth rates

(average annual percentages)

	1991-1995	1996-2000	2001-2005
Czech Republic	-1.0	1.5	3.3
Estonia	-6.2	5.6	7.3
Latvia	-11.8	5.4	7.8
Lithuania	-10.0	4.2	7.7
Hungary	-2.4	4.0	4.1
Poland	2.2	5.1	2.9
Slovenia	-0.6	4.4	3.4
Slovakia	-1.7	3.7	4.8
EU8	-0.8	4.1	3.7
euro area	1.5	2.8	1.5

Source: ECB calculations based on the Groningen Growth and Development Centre (GGDC) Total Economy Database, May 2006.
Note: Data for the EU8 and euro area refer to weighted growth rates.

Since 1996 real GDP growth has resumed in all countries, reflecting progress in macroeconomic stabilisation and the implementation of a wide range of structural reforms.[6] During 1996-2000, output growth was especially strong in Estonia, Latvia, Lithuania, Poland and Slovenia and to a lesser extent in Hungary and Slovakia. The recovery was slower in the Czech Republic, largely owing to the recession that followed the financial crisis in 1997. In the subsequent years 2001-05, real GDP growth further accelerated in all EU8 countries, with the exception of Poland and Slovenia, which nonetheless continued to register positive growth rates. Several factors have contributed to this development. First, the macroeconomic stabilisation and structural reforms accomplished in the 1990s have favoured inter alia sizeable foreign direct investment (FDI), the recovery of domestic investment and productivity growth. Moreover, lower interest rates and the gradual development of the financial sectors in these economies have supported domestic demand. The prospect of accession to the EU, which took place on 1 May 2004, also supported this process. Entry into the EU required not only the implementation of significant legal and institutional reforms (e.g. the adoption of the *acquis communautaire*) but also spurred further trade and financial integration with the EU and the euro area.

The relatively strong growth performance in EU8 countries relative to the euro area also led to some progress in real convergence, defined here as convergence in per capita income levels.[7]

Although per capita income levels increased in all EU8 countries relative to the euro area over the last decade, in 2005 they were on average only slightly above 50% of the euro area level in purchasing power parity (PPP) terms (see

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6 The high growth rates also reflect a base effect owing to the large initial drop in output.
7 In some EU8 countries, demographic trends also contributed to real convergence. In Latvia and Estonia, in particular, the population declined by more than 7% between 1995 and 2005, resulting – all other things being equal – in higher levels of GDP per capita.

Table 2 GDP per capita in purchasing power parity terms

(euro area = 100)

	1995	2000	2005	Difference 2005-1995 [1]	Estimated year for achieving convergence with euro area average [2]
Czech Republic	63.6	60.6	67.3	3.7	2025
Estonia	29.8	35.9	49.7	19.9	2040
Latvia	25.7	30.8	43.8	18.1	2047
Lithuania	30.4	33.3	46.1	15.7	2044
Hungary	46.6	50.8	59.2	12.6	2031
Poland	36.6	41.4	45.1	8.5	2045
Slovenia	64.0	69.5	77.1	13.1	2018
Slovakia	42.0	44.1	52.1	10.0	2038
EU8	42.0	45.4	51.6	9.5	2038
Average	42.3	45.8	55.1	12.7	..
Standard Deviation	14.9	13.7	11.9	-2.9	..

Source: ECB staff calculations based on the GGDC Total Economy database, May 2006.
1) In percentage points. EU8 is a weighted average.
2) Assuming an annual real GDP growth differential of two percentage points between the EU8 countries and the euro area.

Table 2).[8] There are some large differences among countries, though they have narrowed somewhat over the last decade, as indicated by lower standard deviation. This finding is consistent with the σ-convergence hypothesis put forward in growth literature.[9] In 2005 Slovenia reached a level of income per capita of more than 77% of the euro area average, while the Baltic States and Poland had levels of below 50%. In addition, the speed of convergence of per capita income levels differs widely across countries. While the Baltic States made remarkable progress regarding real convergence with the euro area in the last decade, per capita income in the Czech Republic is today almost at the same level as a decade ago. In general, countries with the lowest income levels in 1995 recorded the highest growth rates in the following ten years, a finding which is in line with the β-convergence hypothesis[10] (see Table 1 and 2). Notable exceptions to this growth pattern are – on the positive side – Slovenia, with relatively high growth compared with its high level of GDP per capita, and – on the negative side – Poland, with relatively slow growth compared with its low level of GDP per capita. The challenge ahead is significant. If the annual real GDP growth differential of the EU8 countries with the euro area remains on average at two percentage points – as in the last five years – it will take the EU8 countries on average around 30 years to converge to the per capita income level of the euro area.

2.2 ANALYSIS OF REAL CONVERGENCE PATTERNS IN THE EU8

As pointed out above, the EU8 countries are characterised by quite large gaps in GDP per capita levels versus the euro area. In order to gain more insight into the nature of these gaps,

8 International comparison of GDP per capita is complicated by technical problems regarding standardised measurement of GDP and conversion of GDP into a common currency. On the first problem, the main differences in methods of GDP calculation across countries concern the treatment of the ratio of capitalised software to total software expenditure (investment ratio), government output, the shadow (non-observed) economy, military expenditure and financial services indirectly measured (FISIM). On the second problem, according to Stapel (2004), PPPs – as a rule of thumb – are subject to a margin of a 5% error. Besides, the PPP is recommended for an interspatial but not for an intertemporal comparison. Consequently, any international comparison of countries' GDP levels should be analysed with caution, and the ranking should be groupwise rather than country by country.
9 See Barro and Sala-i-Martin (1991). This hypothesis implies that the dispersion in GDP per capita across countries falls over time.
10 When the partial correlation between growth in income over time and its initial level is negative, there is β-convergence.

Chart 1 Relative labour productivity levels in the EU8

(euro area = 100)

(per worker)

(per total hours worked)
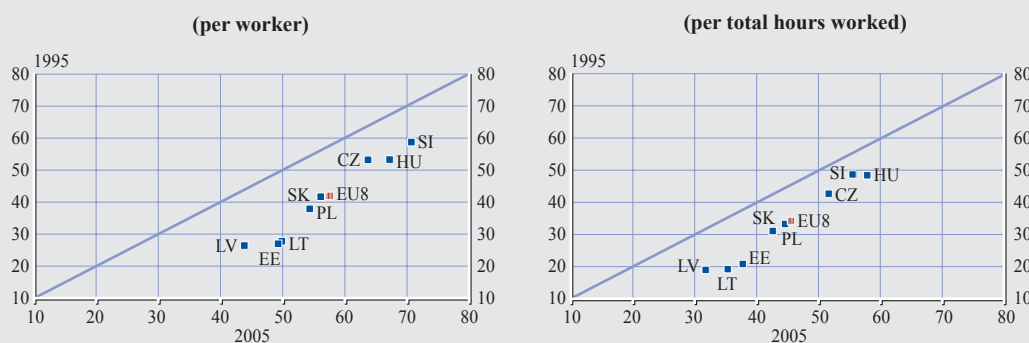
Source: ECB staff calculations based on the GGDC Total Economy Database, May 2006.
Notes: Data for the EU8 refer to a weighted average. Points below/above the diagonal line mean an improvement/deterioration in the indicator.

the current sub-section looks into differences in labour utilisation and productivity between the EU8 countries and the euro area. As a first step GDP per capita is decomposed according to the following formula:

$$\underbrace{\frac{GDP}{POP}}_{} = \underbrace{\frac{EMP}{POP}}_{labour\ utilisation} * \underbrace{\frac{GDP}{EMP}}_{labour\ productivity \atop per\ worker} = \underbrace{\frac{EMP}{POP}}_{labour \atop utilisation} * \underbrace{\frac{THW}{EMP}}_{} * \underbrace{\frac{GDP}{THW}}_{labour\ productivity \atop per\ hour}$$
(1)

where GDP is gross domestic product, POP is population, EMP is total employment, and THW is total hours worked. This decomposition allows differences in labour productivity and labour utilisation to be investigated.

Starting with labour productivity, Chart 1 shows that all EU8 countries improved their relative labour productivity position against the euro area between 1995 and 2005 (as measured in terms of total employment), although the gap remains quite significant.

Labour productivity measured in terms of employment is not the best possible productivity measure, as it fails to take account of differences and changes in working time across countries. It is therefore preferable to use labour productivity per hour worked.[11] However, for the EU8 countries the two measures of labour productivity provide a similar picture regarding

developments over time (Chart 1). The main difference is in the levels of labour productivity, with the per hour measure indicating much lower levels for the EU8 countries and consequently larger gaps versus the euro area. As discussed in more detail below, this implies that average hours worked in the EU8 countries are higher than in the euro area.

Turning to the analysis of labour utilisation, in 2005 the ratio of total employment to total population was significantly lower than in the euro area for Lithuania, Hungary, Poland and Slovakia (Chart 2).[12] It is worth noting that since 1995 the overall labour utilisation has deteriorated in most EU8 countries except for Latvia, Hungary, and Slovenia. But even in those countries the improvement was very small, and in Hungary labour utilisation remains at a very low level.

11 For the EU8 countries the quality and availability of time series on total hours worked are not optimal. This also applies to some euro area countries. Consequently, the comparison of labour productivity (and also labour utilisation) using total hours worked must be analysed with great caution.

12 It should be noted, however, that labour utilisation in the euro area is very low by international standards and is thus not the best benchmark. In 2005 labour utilisation in the euro area was lower than in the United States by around 14% and than in Japan by around 9%.

Chart 2 Labour utilisation

(euro area = 100)
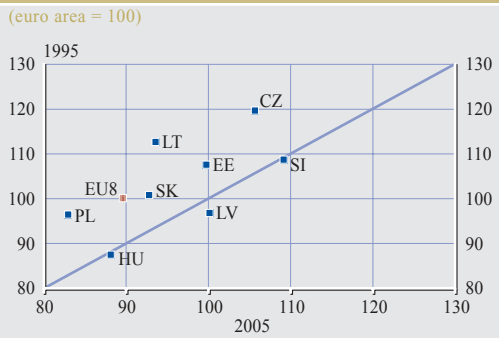
Source: ECB staff calculations based on the GGDC Total Economy Database, May 2006.
Notes: Labour utilisation is defined as the ratio of total employment to total population. Data for the EU8 refer to a weighted average. Points below/above the diagonal line mean an improvement/deterioration in the indicator.

In order to take demographic developments into account, overall labour utilisation is further disaggregated according to the formula:

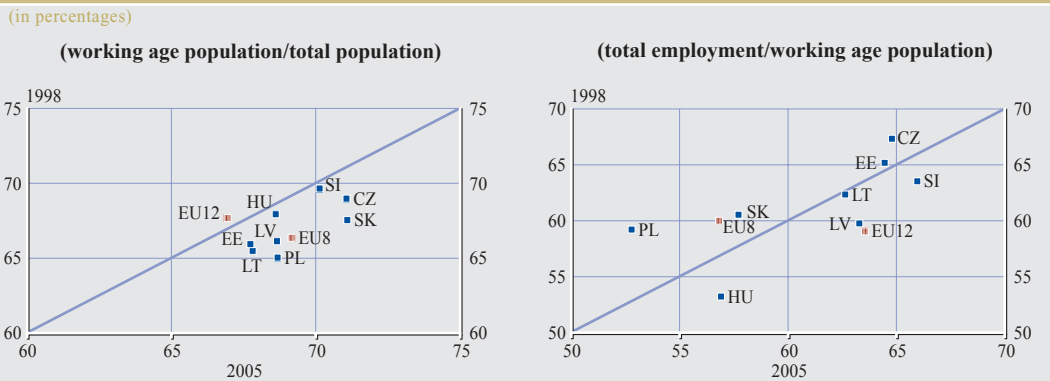$$\underbrace{\frac{EMP}{POP}}_{\substack{labour \\ utilisation}} = \underbrace{\frac{POPWA}{POP}}_{\substack{age \ structure \\ of \ population}} * \underbrace{\frac{EMP}{POPWA}}_{\substack{employment \\ rate}} \qquad (2)$$

where POPWA stands for the working age population. The first component captures the age structure of the population, and the second is the employment rate.[13]

Chart 3 shows that the main change in labour utilisation between 1998 and 2005 came from

developments in employment rates, as the age structure of the population improved only marginally.[14] For five EU8 countries the employment rates deteriorated or remained roughly unchanged during the eight years. In general, employment rates were at a relatively low level in 2005 (especially in Poland and Slovakia, but also in Hungary, where the rate actually increased).[15]

Turning to average hours worked (and bearing in mind the above-mentioned caveats regarding the reliability of data on total hours worked), people in employment in the EU8 countries (especially in the Baltic states) appear to work much longer hours than in the euro area

13 Unfortunately, the GGDC database does not contain working age population series, and the ratios in formula (2) cannot be calculated. The Eurostat Labour Force Survey (LFS) database is thus used instead. It should be noted, however, that the data from the two databases are not entirely comparable, and the samples differ slightly. For most countries and years the differences between total employment from the two sources do not exceed 3%. However, for Latvia and Lithuania the LFS figures are around 10% lower than those in the GGDC database, and for Slovenia they are around 20% higher. For most EU8 countries, the time series in the LFS database start in 1998, whereas in the GGDC database they start in 1989. There are also differences in population figures between the two databases.
14 Regarding the prospects for labour supply, according to the 2005 Eurostat population projections, the EU8 countries are expected to experience a decline in their total and working age populations and a gradual ageing of the population over the next ten years.
15 For more details on labour market developments in the EU8 see Section 3.

Chart 3 Decomposition of labour utilisation

(in percentages)

(working age population/total population)

(total employment/working age population)

Sources: Eurostat Labour Force Survey (LFS) database and European Commission Ameco database.
Notes: Data on total population for Lithuania and Poland are taken from the Ameco database. Data for the EU8 and euro area (EU12) refer to weighted averages. Points below/above the diagonal line mean an improvement/deterioration in the indicator.

Chart 4 Average hours worked per year
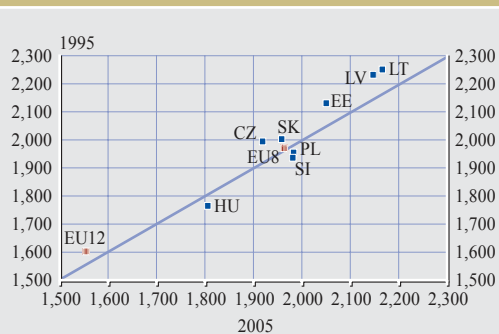
Source: ECB staff calculations based on the GGDC Total Economy Database, May 2006.
Notes: EU8 and euro area (EU12) refer to weighted averages. Points below/above the diagonal line mean an improvement/ deterioration in the indicator.

(Chart 4).[16] This most likely reflects differences in product and labour markets regulations (for instance longer opening shop hours in the EU8 than in the euro area; a shorter working week in France; high non-wage labour costs in the EU8, favouring employment of fewer employees working longer hours), differences in work and leisure preferences, and a smaller proportion of part-time arrangements in the EU8 countries than in the euro area.

In addition to the analysis of the differences in the level of GDP per capita between the EU8 countries and the euro area, it is useful to investigate changes in GDP per capita. As population figures have been relatively stable over the last decade, changes in GDP per capita can be approximated by real GDP growth.[17] For this purpose, we assume that output is given by a Cobb-Douglas production function:

$$GDP = TFP * K^{\alpha} * EMP^{1-\alpha} \qquad (3)$$

where TFP stands for total factor productivity, K for the capital stock, EMP for labour and α and (1-α) for the respective shares of capital and labour in GDP.[18] Conducting a GDP growth disaggregation according to equation (4) requires data on TFP and capital stocks. Reliable and comparable data on capital stocks in the

EU8 countries are, however, not available. Therefore, they are approximated by the perpetual inventory method.[19]

Between 1996 and 2005 TFP growth made a very significant contribution to GDP growth in all EU8 countries, with the exception of Latvia in the period 1996-2000 (Chart 5). Although the exact magnitude of the TFP contribution may be overestimated – to the extent that capital and labour are underestimated (for instance due to the assumed high depreciation rate or unrecorded black market employment) – this result is quite intuitive and still holds for alternative assumptions on capital depreciation rates. On the accounting side, given relatively small changes in labour and capital inputs, high GDP growth rates necessitate fast growth in TFP. The economic explanation is that the transition process – involving privatisation, restructuring, higher competition, deregulation in product and labour markets, opening to international trade, FDI inflows, transfer of technologies, etc. – has forced a more efficient use of production inputs and better managerial practices, which are captured by TFP. On the other hand, for most of the EU8 countries, the contribution of labour to GDP growth was very modest or even negative in 1996-2000. The above findings are broadly corroborated by other studies that undertake a similar exercise for the EU8 countries (see

16 However, this benchmark is relatively low by OECD standards. For instance, in 2005 average hours worked amounted to 1,819 in the United States, 1,749 in Japan and 1,621 in the United Kingdom, while in the euro area the figure was 1,554.
17 Average growth in real GDP and real GDP per capita is almost identical for most of the EU8 countries. The exceptions are Estonia and Latvia, where due to a decline in the population, growth in real GDP per capita is significantly higher than growth in real GDP.
18 In line with the growth literature it is assumed that α=0.35.
19 This method calculates capital stock using the equation $K_t = K_{t-1}(1+i_t-d_t)$, where K_t is the capital stock in period t, i_t is the rate of investment growth between period $t-1$ and t, and d_t is the rate of depreciation of capital stock in the same period. For the sake of this exercise, a constant depreciation rate of 7% per year is assumed across countries. Because of this crude assumption, the calculated changes in capital stocks must be treated as very rough approximations. Some sensitivity checks have been performed with regard to this assumption, and, generally, alternative levels of the depreciation rate do not change the main conclusion of the analysis.
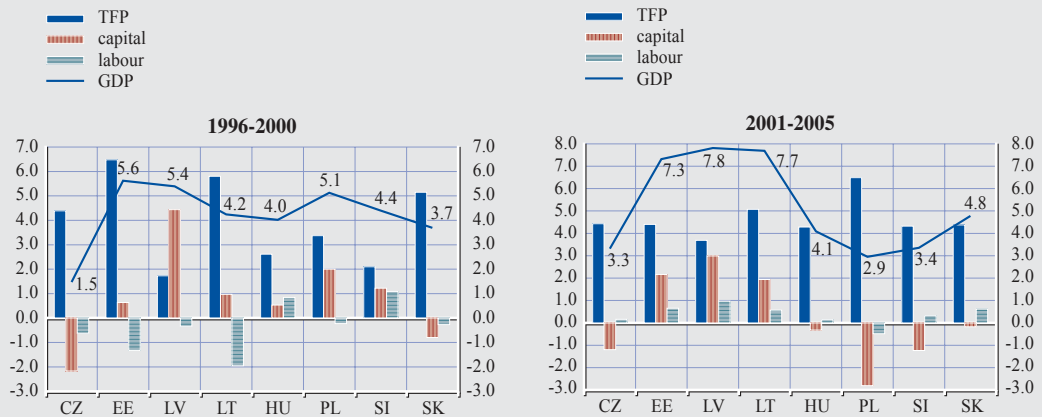
Source: ECB staff calculations based on the GGDC Total Economy Database, May 2006.

Doyle et al., 2001; European Commission, 2004a; and IMF, 2006).[20]

Once the GDP growth decomposition according to formula (3) has been done, it is also possible to calculate contributions to average labour productivity growth, which is given by:

$$ GDP / EMP = TFP \left(\frac{K}{L} \right)^{\alpha} \qquad (4) $$

The results show that labour productivity in most EU8 countries was mainly driven by TFP advancements. Only in the Baltic countries in

both analysed periods and in Poland and Slovenia in 1996-2000 was the contribution of the capital-labour ratio to labour productivity growth positive and relatively important

20 The results are not directly comparable, however, as time and country coverage differs among these studies. IMF (2006), which is most comparable study, notes an especially high contribution from TFP growth as compared with other emerging markets. Doyle et al. (2001), analysing only five central and eastern European countries over the 1991-99 period, finds a higher contribution from capital but also notes an important role for TFP in the more successful economies. European Commission (2004a) also points to a more even contribution from capital and TFP to GDP growth in the new EU Member States over the 1996-2005 period.

Source: ECB staff calculations based on the GGDC Total Economy Database, May 2006.
Note: Labour productivity is calculated in terms of total employment.

(Chart 6). It should be noted that in some countries the capital-labour ratio contributed negatively to labour productivity growth. Chart 6 also demonstrates that Estonia, Latvia and Lithuania enjoyed the highest labour productivity growth in both analysed periods. The Czech Republic, Slovenia and to a lesser extent Hungary recorded the lowest growth rates. This ranking seems to be consistent with the assumption that countries with a lower starting level of labour productivity experience faster growth in labour productivity. There are some differences in the composition and magnitudes of labour productivity growth between the two periods, especially for Latvia, Poland and Slovenia.

Summarising the above analyses, some common patterns of the catching-up process in the EU8 countries over the last ten years can be distinguished. All EU8 countries managed to increase their relative levels of GDP per capita vis-à-vis the euro area. This was primarily achieved by boosting labour productivity, as only Latvia, Hungary and Slovenia improved or maintained their relative labour utilisation positions at the same time. For the remaining six countries, it seems that the gains in labour productivity came at the cost of lower labour utilisation. However, the strength of this relationship varies among countries and looks to be relatively mild in the Baltic states where the growth in labour productivity was the highest and changes in labour utilisation were similar to other countries. The advancement in GDP growth and labour productivity was mainly attributable to TFP improvements, which is consistent with the expected effects of the far-reaching economic transformation that has taken place in the EU8 countries.

3 LABOUR MARKETS

Labour market performance affects the degree of labour utilisation in a country and therefore plays an important role in the determination of the per capita income levels and growth rates. The purpose of this section is to present recent labour market developments and the prospects for labour utilisation in the EU8 countries. The section starts with a description of some key determinants of the functioning of labour markets, followed by a review of the performance of labour markets in the EU8 countries. It then continues by looking at skill and regional mismatches and finally reviews labour market institutions.

3.1 GROWTH AND LABOUR MARKETS – THEORETICAL ASPECTS

A high employment rate, a skilled workforce and an efficient allocation of labour (both across regions and sectors) are crucial determinants for the growth and real convergence prospects of the EU8 countries. More specifically, the functioning of a country's labour market has an important impact on the pace at which its economy can grow without creating inflationary pressures.

Mismatches between the characteristics of the non-employed and the jobs available – in terms of skill levels, occupations, regions and sectors – may relate to a number of factors: among others, demographic changes, changes in the composition of the workforce (in terms of gender and age), and changes in the production structure. While the importance of the first two aspects should be kept in mind, this section focuses on labour market imbalances resulting from the shift in the sectoral composition of production experienced by the EU8 economies over the last decade. Although this phenomenon can be seen as a temporary one, its persistence may vary across countries. In this context, a crucial role may be played by the institutional setting, both inside and outside the labour market, including, for instance, policies for better education and long-life learning. The higher the ability of the labour force to rapidly adapt to a changing structure of production (and therefore to changing labour requirements) the smoother the process of reallocation of the workforce.

A number of labour market variables are normally seen to have an effect on the degree of labour utilisation across economies and, thus, on the income per capita levels and growth rates. In particular, labour market performance may be strongly influenced by basic labour market institutions, such as employment protection legislation (EPL), minimum wages and collective wage bargaining. These institutional features of the labour market tend to provide protection for workers and may have desirable welfare effects. However, they may also impose rigidities and distortions that can lead to adverse labour market outcomes.

First, EPL, which refers to regulations concerning the dismissal of workers, tends to raise labour costs, as it constitutes a tax on workforce adjustment. Indeed, high termination costs make it more difficult for employers to dismiss workers, thereby also raising the costs of recruitment. As a consequence, stringent EPL limits employers' incentives to hire new workers and may result in a reduced number of vacancies, lower job turnover, and longer spells of unemployment. It has been also argued that labour protection strengthens the position of "insiders", making it more difficult for "outsiders" to find a job, thus contributing to the persistency of unemployment.[21] Flexible EPL on the other hand, facilitates the adjustment of a company's workforce to variations in demand and in turn allows those people who are unemployed to move back into employment. Although the results of empirical research in this field are very often ambiguous and fail to reveal any consistent effect of EPL on the level of unemployment and employment rates, EPL does appear to be relevant for the dynamics of the labour market.[22] According to most empirical studies, it leads to fewer dismissals in recession periods and lower recruitment in expansions, thereby significantly increasing the average spell of unemployment.[23]

Second, labour market outcomes are affected by legally binding minimum wages. Although these are meant to protect unskilled workers, who have limited bargaining power, and to provide a guarantee of a certain minimum standard of living, minimum wages may reduce workers' chances of being hired, by raising the cost to employers of less skilled, low-productive workers.

Finally, the level of coordination of collective bargaining is another factor that influences wage formation and, hence, labour utilisation. According to Calmfors and Driffill (1988), the relationship between the degree of centralisation of wage bargaining and unemployment follows an inverted U-shape. Fully centralised and fully decentralised bargaining are expected to result in the lowest unemployment, while in-between regimes are expected to lead to higher unemployment. According to this argument, fully centralised bargaining at the national level can better take into account the economy-wide consequences of wage bargaining, while fully decentralised regimes can better reflect the productivity developments at the firm level.

3.2 RECENT DEVELOPMENTS IN THE EU8 COUNTRIES

Over the period 1997-2005, the employment rate declined in the Czech Republic, Estonia, Lithuania, Poland and Slovakia (Table 3). In the Czech Republic, Poland, and Slovakia this decline was associated mainly with a strong increase in the unemployment rate. The deterioration of the labour market situation was particularly severe in Poland and Slovakia, where the unemployment rate reached almost 20% of the labour force on average in the years 2001-05, and the employment rate fell to a mere 52% and 57%, respectively. Furthermore, Poland also experienced a notable decrease in the participation rate.[24] By contrast, some other EU8 countries, such as Latvia, Hungary and Slovenia, experienced a more encouraging labour market performance, with an

21 See Bentolila and Bertola (1990).
22 See Cazes (2002), Ederveen and Thissen (2004).
23 For a summary of empirical studies on labour market institutions, see for example European Commission (2004b).
24 The participation rate is defined as the share of the labour force (employed and unemployed) in the working age population.

Table 3 Labour market indicators

(in percentages)

		1997	2000	2001	2005	1997-2000	2001-2005
Czech Republic	Employment rate	68.6	64.9	65.0	64.7	66.7	64.8
	Unemployment rate	4.3	8.8	8.0	7.8	6.9	7.8
	Participation rate	71.7	71.2	70.7	70.2	71.6	70.3
Estonia	Employment rate	65.3	60.4	60.8	64.9	63.2	62.5
	Unemployment rate	10.5	13.3	12.6	8.2	11.3	10.4
	Participation rate	72.9	69.7	69.5	70.8	71.2	69.8
Latvia	Employment rate	59.8	57.4	58.9	63.0	58.7	61.3
	Unemployment rate	14.7	14.5	13.4	9.2	14.4	11.4
	Participation rate	70.1	67.1	68.0	69.4	68.5	69.1
Lithuania	Employment rate	62.1	59.6	58.1	62.7	61.4	61.1
	Unemployment rate	13.9	16.2	17.1	8.6	14.6	12.7
	Participation rate	72.1	71.2	70.1	68.6	71.9	70.0
Hungary	Employment rate	52.0	55.9	56.1	56.8	54.1	56.5
	Unemployment rate	9.0	6.6	5.7	7.1	7.8	6.0
	Participation rate	57.1	59.9	59.5	61.2	58.7	60.2
Poland	Employment rate	58.8	55.1	53.6	52.2	57.7	52.1
	Unemployment rate	11.2	16.6	18.7	18.3	12.7	19.3
	Participation rate	66.2	66.1	66.0	63.9	66.1	64.5
Slovakia	Employment rate	60.6	56.3	56.7	57.4	58.3	57.0
	Unemployment rate	12.2	19.1	19.4	16.4	15.8	18.0
	Participation rate	69.0	69.6	70.4	68.7	69.2	69.6
Slovenia	Employment rate	62.8	62.7	63.6	66.0	62.9	64.4
	Unemployment rate	6.9	7.0	5.8	5.9	7.2	6.1
	Participation rate	67.4	67.4	67.5	70.2	67.8	68.6
EU8	Employment rate	59.6	57.3	56.6	56.5	59.4	56.1
	Unemployment rate	9.4	13.9	14.8	13.8	10.9	14.6
	Participation rate	65.8	66.6	66.5	65.5	66.6	65.7
Euro area	Employment rate	60.1	62.8	63.5	64.7	61.4	64.1
	Unemployment rate	10.9	8.6	7.5	8.3	9.8	7.9
	Participation rate	67.4	68.7	68.6	70.6	68.1	69.6

Source: Eurostat.
Notes: Data generally refer to the second quarter of each year. They may therefore not be directly comparable with data representing annual averages or referring to other points in time. Data for Poland in 1999 refer to the first quarter. 1997 data for Latvia, Lithuania and Slovakia refer to 1998.

unemployment rate continuously declining from 1997. Participation rates increased significantly in Hungary and Latvia.

Overall, in comparison with the average for the euro area, the indicators presented above point to a relatively weak performance of the EU8 labour markets. In particular, the employment rate gap between the EU8 and the euro area remained negative and widened over the period under consideration, especially from 2000. The above-mentioned developments in the labour market have reflected to some extent the process of economic restructuring faced by the EU8 countries in the last decade. All EU8 countries have seen the share of the services sector increase at the expense of the shares of the agricultural and industrial sectors. Even today, the difference in the economic structure of the EU8 relative to the other EU countries is reflected in the sectoral composition of production and employment. Compared with the euro area, agriculture and industry still provide a larger share of employment (see Chart 7); the percentage of people employed in agriculture in 2005 ranged from around 4% in the Czech Republic and Slovakia to 17.6% in Poland. This is much lower than ten years ago but still significantly higher than the average of 4.3% recorded for the euro area in 2005. The
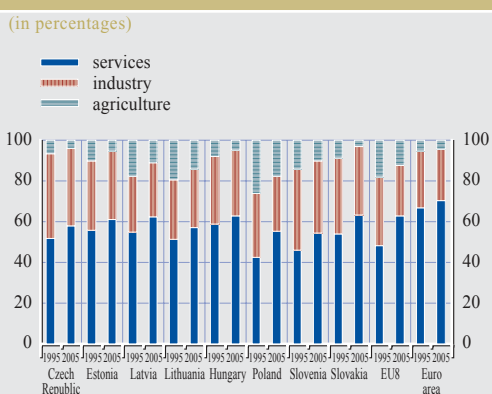
Source: Eurostat.

share of people employed in industry also remains in all countries higher than in the euro area. The service sector in the EU8 is still small in comparison with the euro area but is gradually becoming more important.

As shown in Table 4, the gap between employment shares in the EU8 and the euro area is particularly large in business services – which typically employs a larger proportion of skilled workers than other service industries.

Chart 7 and Table 4 illustrate the very fast sectoral and technological change that has taken place in the EU8 economies over the last decade. In addition, robust economic growth in

recent years has tended to be accompanied by a rapid spatial reallocation of economic activity. Capital regions (and in some EU8 countries western border regions) have generally been the fastest growing areas in the EU8, whereas economic development in other regions has often remained lacklustre. As it takes time for workers to build up the necessary skills to move from old technology sectors to more modern sectors and/or to change their place of residence, sectoral and regional changes are likely to have created significant labour market mismatches in the EU8 economies. This aspect of labour market performance is examined in the next sub-section.

3.3 LABOUR MARKET MISMATCHES IN THE EU8 COUNTRIES

The structural change in the composition of output and employment in the EU8 countries brought about by the transition process is associated with a change in the composition of the workforce by qualification and skill level. This often implies an increased mismatch between the demand for skilled workers and a lower-skilled labour supply, which has effectively reduced labour supply and possibly created growth bottlenecks.[25] The high and, in some cases, increasing share of unemployed

25 In fact, despite several years of strong real GDP growth in most EU8 countries, employment and unemployment rates have often shown considerable persistence.

Table 4 Employment shares, services subsectors

(in percentages)

	Financial, real estate, renting and business activities			Trade, repairs, hotels, restaurants, transport and communications			Other service activities		
	1997	2000	2005	1997	2000	2005	1997	2000	2005
Czech Republic	7.1	7.7	12.0	24.5	24.2	24.8	21.5	23.5	21.0
Estonia	6.6	8.3	8.8	25.2	27.1	25.8	26.2	24.3	26.4
Latvia	5.0	7.4	6.9	22.7	26.0	28.6	26.0	26.4	26.9
Lithuania	4.7	4.1	5.4	23.1	22.7	24.3	26.5	27.9	27.5
Hungary	6.4	7.5	9.2	25.7	26.1	26.5	26.5	26.1	27.0
Poland	n.a.	7.3	n.a.	n.a.	20.8	n.a.	n.a.	18.3	n.a.
Slovenia	8.6	9.4	13.1	21.3	21.5	21.2	18.0	19.1	20.5
Slovakia	7.1	8.2	n.a.	22.6	24.4	n.a.	24.6	26.7	n.a.
EU8	6.6	7.4	9.5	24.1	22.7	24.2	24.0	21.6	21.4
euro area	12.6	14.2	15.0	24.7	24.8	24.9	29.5	29.3	30.4

Source: Eurostat.

Table 5 Unemployment rates by educational attainment

(in percentages of the population aged 15-64)

	2000	2001	2002	2003	2004	2005
Czech Republic						
primary	22.8	21.7	20.6	22.1	26.2	27.3
secondary	7.9	7.1	6.4	6.9	7.5	7.1
tertiary	3	2.5	1.8	2.1	2.1	2.1
Estonia						
primary	26.4	19.9	20	18.8	21.1	15.2
secondary	14.8	13.4	10.3	12.5	10.7	10.1
tertiary	5	8	4.7	5.4	6	3.2
Latvia						
primary	22.5	22.2	24	17.6	16.6	18.6
secondary	14.9	13.2	13	10.3	10.6	8.9
tertiary	7.4	5.6	6.6	6.3	3.6	3.9
Lithuania						
primary	25.7	24.9	19.2	22.4	14.9	16
secondary	20.3	19.5	14.5	13.8	12.8	9.7
tertiary	9.4	7.4	6.8	6.4	6.8	3.8
Hungary						
primary	11.6	11.2	11.4	12.4	12.5	14.2
secondary	6.5	5.3	5.1	5.4	5.4	6.9
tertiary	1.4	1.2	1.8	1.4	2.2	2.5
Poland						
primary	23.4	25.9	28.1	28	30.3	30.1
secondary	17.1	19.5	21.2	20.9	20.4	19.4
tertiary	5.4	5.7	6.6	7.1	7.3	6.8
Slovenia						
primary	11.5	9.8	9.4	11.2	10.1	9.1
secondary	7	5.5	6.1	6.3	6.1	6
tertiary	2.2	2.3	2.5	3.8	2.8	3.1
Slovakia						
primary	40.5	42.5	46.1	47.1	52.1	53.1
secondary	18.4	18.8	17.8	15.9	17	14.4
tertiary	5.2	5.2	3.9	4.4	5.9	5.2
EU8 average						
primary	23.1	22.3	22.4	22.5	23.0	23.0
secondary	13.4	12.8	11.8	11.5	11.3	10.3
tertiary	4.9	4.7	4.3	4.6	4.6	3.8
Euro area						
primary	12.3	10.6	11.0	11.6	12.0	12.0
secondary	8.4	7.8	8.1	8.7	9.1	8.9
tertiary	5.5	4.8	5.2	5.6	5.9	5.7

Source: Eurostat.

persons having only primary and secondary schooling in most EU8 countries (see Table 5) also reflects the fact that the economic transition has led to labour shedding and job relocation, with jobs destroyed in low productivity industries and created in higher productivity industries and in the underdeveloped services sector. Skill mismatches are particularly marked in the Czech Republic, Poland and Slovakia, where educational attainment has become increasingly important in determining employment status.[26]

An additional symptom of the skill mismatch is the low exit rate from the pool of unemployed and a high incidence of long-term unemployment in all EU8 countries (see Table 6). In 2005 the percentage of the jobless having been unemployed for more than one year ranged from around 44% in Hungary to over 71% in Slovakia, against the 44.9% recorded in the euro area.

26 For empirical analysis of skill mismatches and cross-sectoral mobility see Lamo, Messina and Wasmer (2006).

Table 6 Labour market performance in the EU8 countries, 2005

	Unemployment rates		
	Total [1]	Youth [2]	Long-term [3]
Czech Republic	7.8	17.9	53.0
Estonia	8.3	19.5	54.1
Latvia	9.2	19.0	46.7
Lithuania	8.6	16.5	54.0
Hungary	7.1	19.2	44.4
Poland	18.3	38.6	58.1
Slovenia	5.9	12.9	51.0
Slovakia	16.3	28.3	71.4
EU8 [4]	10.2	21.5	54.1
euro area	9.1	17.8	44.9

Source: Eurostat.
1) Unemployed persons aged 15-64 as a percentage of the labour force (employed and unemployed) aged 15-64.
2) Unemployed persons aged 15-24 as a percentage of the labour force (employed and unemployed) aged 15-24.
3) Long-term unemployment (12 months or more) as a percentage of total unemployment.
4) Unweighted average.

More detailed information on educational mismatches in the EU8 countries tends to be country-specific and is not available for all EU8 countries. In Slovakia less than a fifth of secondary school students attend schools leading to higher education, the remainder studying at technical and vocational schools that are primarily aimed at the industrial sector (see OECD, 2002d). In Slovenia, too, the increasing mismatch between required and available skills has become the main reason for the rise in long-term unemployment and the main obstacle to higher employment growth. In the Baltic States, however, the average level of educational attainment of the population is relatively high (OECD, 2000a). In all three Baltic countries groups having spent longer in education perform better in the labour market than those with less education, as shown by the higher participation rates. Although to a differing extent, in all EU8 countries a better labour market performance would require training opportunities to be provided for displaced workers and, more generally, an improvement in the ability of education systems to respond – in both qualitative and quantitative terms – to an increasing demand for better qualifications.[27]

The existing skill mismatches may be worsened by the increased labour migration from the EU8 countries to some of the EU15 countries following the opening of their labour markets.[28] Given that young and qualified workers typically show the highest propensity to migrate, increased east-west migration within the EU, while on aggregate economically beneficial and desirable, may temporarily aggravate existing labour market bottlenecks in some sectors in the EU8 countries.

Like skill mismatches, regional mismatches may have potentially harmful consequences for economic growth. Persistent regional disparities combined with low spatial labour mobility may in fact lead to a permanent reduction in effective labour supply, and therefore a reduction in potential output.[29] Looking at the data, it seems that in many EU8 countries, unemployment

27 Assessing the quality of education systems in these countries in more detail would require a much broader range of indicators. For a more detailed analysis of educational systems in the EU8 countries, see for example OECD (2006).
28 See for example Heinz and Ward-Warmedinger (2006).
29 Some studies suggest that apart from the decline in potential output, regional labour mismatch may also reduce the responsiveness of wages to rising unemployment and hence increase vulnerability to inflationary pressures (see Boeri and Scarpetta, 1996, and Cameron and Muellbauer, 1998).

Chart 8 Regional disparities in unemployment rates in the EU8 countries, 2003

(in percentages of the labor force)

■ national average
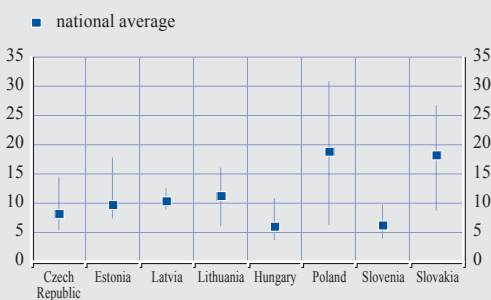
Source: Eurostat.

rates vary considerably across regions.[30] Depending on the initial conditions (such as sectoral composition, characteristics of the labour force and existing infrastructure) the restructuring process has often resulted in considerable regional heterogeneity (see Chart 8). Generally, regions that inherited old industrial structures, such as mining or heavy industry have experienced more labour market problems. Capital regions, which are usually characterised by more dynamic labour markets, tend to exhibit the lowest unemployment rates. Gruber (2004) predicts that in the absence of sufficient inter-regional migration the regional disparities will increase more rapidly in the future, as further economic restructuring and reallocation will boost unemployment in rural and industrial areas, and at the same time raise employment in large cities with growing service sectors.

Given the existing regional unemployment differences, migration would appear to be an important balancing mechanism for regional adjustment. But despite wide differences in the incidence of unemployment across regions, internal migration flows remain very small in the EU8 countries, even compared with the also relatively low rates of internal migration observed in the euro area. Fidrmuc and Huber (2004) and Fidrmuc (2004) find that the impact of unemployment on net migration flows is statistically significant. However, the scale of movement is not sufficiently large to act as an

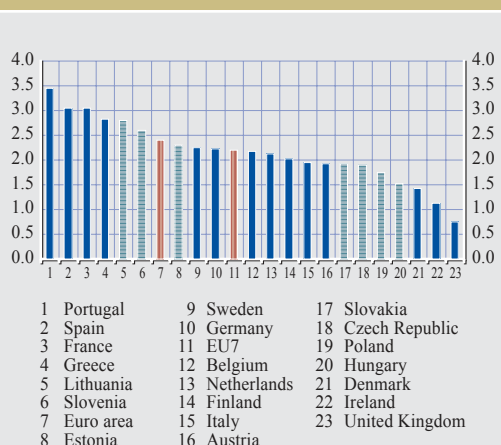effective adjustment mechanism to reduce regional disparities.

Many factors may negatively affect migration. Fixed costs, such as search and information costs and relocation costs, may be sufficiently high to deter low-wage earners and the unemployed from migrating. In most of the EU8 countries, low labour mobility is strongly affected by the existing skills and education mismatches mentioned above, as unemployed people from depressed regions dominated previously by agriculture and heavy industry often lack the skills required in more economically advanced regions. Fidrmuc and Huber (2004) find that the low-skilled are likely to have the lowest propensity to migrate. In addition, institutional settings may play a role in determining migration flows. For instance, social transfers usually do not differ in nominal terms from one region of a country to the next. As a consequence, an unemployed person may be discouraged from moving into a high-cost region, knowing that his or her real income will diminish. Cameron and Muellbauer (1998) suggest that the housing market could be a factor behind the low inter-regional labour mobility, as high relative house prices increase the costs associated with moving from economically depressed regions to better-off regions.

3.4 LABOUR MARKET INSTITUTIONS IN THE EU8 COUNTRIES

The structural shift described in the previous section has resulted in job losses in industry and agriculture. This process has not, however, been accompanied by sufficient job creation in the service sector. As argued above, economic theory suggests that the sluggish labour demand, in particular for low-skilled workers, may be attributed to the existing labour market

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30 Boeri and Scarpetta (1996) find that unemployment differentials in central and eastern Europe are not lower than in Italy or Spain, which are the two countries with the most marked regional disparities in the EU. They note, however, that the international comparison of regional disparities is very often difficult given the differences in the size of regions across countries.

1	Portugal	9 Sweden	17 Slovakia
2	Spain	10 Germany	18 Czech Republic
3	France	11 EU7	19 Poland
4	Greece	12 Belgium	20 Hungary
5	Lithuania	13 Netherlands	21 Denmark
6	Slovenia	14 Finland	22 Ireland
7	Euro area	15 Italy	23 United Kingdom
8	Estonia	16 Austria	

Source: OECD (2004); for Estonia, Lithuania and Slovenia Tonin (2005).
Note: Higher values of the index indicate more strict EPL.

institutions, such as EPL, minimum wages and collective bargaining processes. This section thus describes the institutional settings of labour markets in the EU8 countries.

Chart 9 presents an overall index of the strictness of EPL in seven of the EU8 countries and in the euro area (no data are available for Latvia)[31]. There exist substantial disparities between these seven EU8 countries. Hungary appears to have the least stringent employment protection regulations, with an EPL index value of 1.7, followed by the Czech Republic (1.9), Slovakia (2.0), and Poland (2.1). Lithuania and

Slovenia have the most restrictive EPL, with index values of 2.8 and 2.6 respectively. Labour markets in most of the EU8 countries (with the exception of Lithuania and Slovenia) appear to have less stringent employment protection legislation than the euro area average. [32]

However, looking at the overall index of EPL might blur some heterogeneity in specific segments of the labour market. Table 7 shows the strictness of EPL in the seven EU8 countries for which data are available, as well as the euro area and the EU15 averages, with a breakdown by regular employment legislation, temporary employment legislation and collective dismissals.[33] It turns out that the seven EU8 countries for which data are available seem to have more stringent regulations than the euro area as far as regular employment is concerned, but a more flexible setting for temporary employment. For collective dismissals the average index is similar (but with significant differences across countries).

31 However, these indicators should be treated with caution.
32 It should be noted, however, that EPL in the euro area is relatively strict by international standards and may thus not be the best benchmark.
33 Regular employment legislation refers to the rules governing procedures for taking on and dismissing permanent workers, including severance payments and notification requirements. Temporary employment legislation establishes the rules for the use of fixed-term contracts, such as maximum duration and renewals, as well as the functioning of temporary employment agencies. Collective dismissals legislation regulates notification requirements and severance payments in the event of large number of workers being dismissed.

Table 7 Employment protection legislation, 2003

	Regular employment	Temporary employment	Collective dismissals	Overall index
Czech Republic	3.3	0.5	2.1	1.9
Estonia	2.7	1.3	4.0	2.3
Lithuania	2.9	2.4	3.6	2.8
Hungary	1.9	1.1	2.9	1.7
Poland	2.2	1.3	4.1	2.1
Slovenia	2.7	2.3	3.3	2.6
Slovakia	3.5	0.4	2.5	2.0
EU7 [1]	2.7	1.3	3.2	2.2
Euro area [1]	2.5	2.3	3.3	2.5

Sources: OECD (2004); for Estonia, Lithuania and Slovenia, Tonin (2005).
1) Calculated as a simple arithmetic average. Euro area aggregates does not include Luxembourg.

Table 8 Part-time and temporary employment, 2005

(in percentages of total employment)

	Part-time	Temporary
Czech Republic	4.8	8.7
Estonia	7.7	3.2
Latvia	9.6	8.7
Lithuania	6.5	5.1
Hungary	4.4	7.2
Poland	10.6	25.5
Slovenia	8.9	17.0
Slovakia	2.4	5.0
EU8	6.9	10.1
Euro area	19.0	15.9

Source: Eurostat.

The proportion of workers on flexible contracts (i.e. either part-time or temporary) can also indicate the degree of labour market flexibility. Despite relatively flexible EPL for temporary employment, in most EU8 countries – except for Poland and Slovenia – the share of workers employed on a temporary basis is significantly lower than in the euro area. Similarly, part-time arrangements constitute a relatively small portion of total employment in comparison with the euro area (see Table 8). This relatively limited use of flexible contracts in the EU8 countries can, however, be attributed to the lesser importance of the service sector, in particular hotels and restaurants, and the retail sector, which normally make the most use of this type of contractual arrangement.

Turning to minimum wage agreements in the EU8, all of these countries introduced minimum wages during the transition period, although both the actual and the relative levels (the ratio of the minimum to the average wage), as well as the coverage (the share of employees earning the minimum wage) differ significantly (see Chart 10 and Chart 11). Initially, minimum wages were set at 45-50% of the average wage, at levels comparable to those in the EU countries. However, since they were insufficiently adjusted during periods of high inflation in the 1990s, their relative level was substantially eroded. As a result of this declining relative value, the minimum wages in the Czech
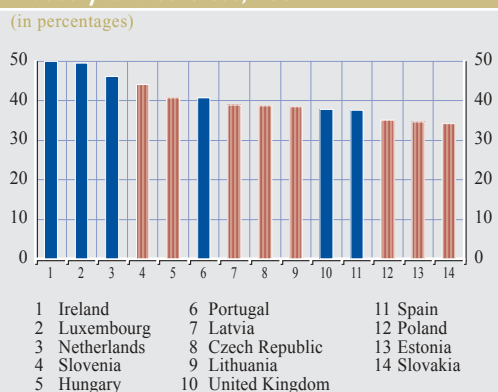
Republic, Slovakia and Slovenia do not appear to be relevant, as the number of people receiving the minimum wage is very low, around 3-5% of all employees. In some other countries though, it has been found that the level of minimum wages is in fact so high that they have a negative impact on employment prospects.

For instance, in Lithuania, the minimum wage appears to act as a barrier, pricing out the low-skilled workers and thus reducing their employment prospects. The minimum wage in Lithuania constitutes 50% of the median wage and is close to 100% of the bottom decile of the wage distribution. The detrimental effect of the minimum wage is particularly pronounced in the industries relying heavily on unskilled labour, such as agriculture, hotels and restaurants and trade. The incidence of minimum wage employment in these industries ranges in Lithuania from 20% to 30% (Rutkowski, 2003).

In Poland, the combination of a flat wage distribution and relatively high minimum wage can be harmful, especially at the lower end of the skill distribution. It has been found that earnings distribution data reveal a visible spike at the minimum wage, suggesting that the minimum wage sets the floor for wages. This is particularly pronounced for blue-collar workers in low-paying sectors such as construction and restaurants and hotels (World Bank, 2001). Given the recently introduced indexation of the minimum wage, the situation may deteriorate further in the future.

Another country that has recently increased its minimum wage is Hungary. Between 2000 and 2002 the minimum wage was raised by almost 100% in nominal terms. It is estimated that one-third of the workers earn now the minimum wage. Kertesi and Köllö (2003) find that Hungary's policy of doubling the minimum wage significantly increased labour costs, thus reducing employment in the small firm sector and adversely influencing the job prospects of low-wage workers.

Chart 10 Minimum monthly wage as a proportion of average monthly earnings in industry and services, 2004

(in percentages)

1 Ireland	6 Portugal	11 Spain
2 Luxembourg	7 Latvia	12 Poland
3 Netherlands	8 Czech Republic	13 Estonia
4 Slovenia	9 Lithuania	14 Slovakia
5 Hungary	10 United Kingdom	

Source: Eurostat.
Note: Data for Estonia, the Netherlands and Portugal refer to 2003, and data for Belgium refer to 2002.

Chart 11 Proportion of full-time employees with earnings at the minimum wage, 2004

(in percentages)

1 Luxembourg	6 Estonia	11 Czech Republic
2 France	7 Portugal	12 Slovenia
3 Lithuania	8 Poland	13 Slovakia
4 Latvia	9 Ireland	14 United Kingdom
5 Hungary	10 Netherlands	15 Spain
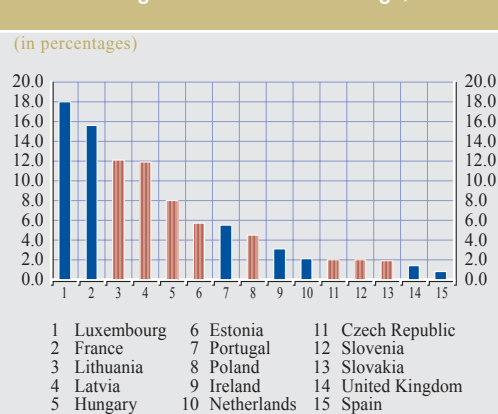
Source: Eurostat.

Although the minimum wage in Slovakia does not seem to be binding (see Chart 11), even at the lower end of the wage distribution, it is used as a basis for the calculation of the "wage tariffs", a scale of minimum wages for the workers not covered by collective bargaining. The system applies to 40% of workers and sets an effective floor on wages. It has not been a constraint so far, but there is a risk that it may become a constraint if the minimum wage continues to rise. Between 1998 and 2001 the minimum wage increased by 64% in nominal terms (OECD, 2002).

Turning to the collective bargaining process, under the communist regime unionisation rates in the EU8 countries were close to 100%. During the 1990s, however, the centralised wage setting was replaced by a collective bargaining system, which mostly operates at the company level (Table 9). The major factors that contributed to the fall in union membership are high levels of unemployment, the privatisation process, the growing number of small and medium-sized enterprises (SMEs) and the sectoral shift. At present unions mostly exert influence in large, not yet privatised firms, while workers in new firms in the expanding service sector are rarely represented

Table 9 Level of collective bargaining, collective bargaining coverage and union density, 2003

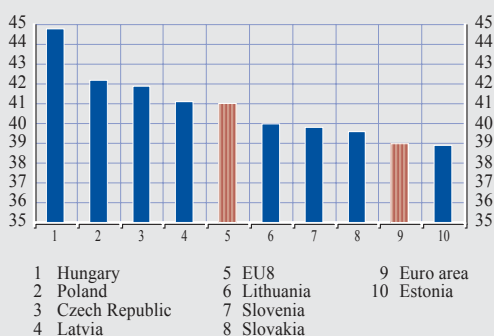|	Dominant bargaining level	Collective bargaining coverage [1] (%)	Union density [2] (%)
Czech Republic	Company	33	..
Estonia	Company	28	17.1
Latvia	Company	19	20.7
Lithuania	Company	15	..
Hungary	Company	31	27.7
Poland	Company	37	19.2
Slovenia	Intersectoral	97	77.7
Slovakia	Sectoral	47	18.5
Euro area		44-99	30.6

Sources: European Industrial Relations Observatory (EIRO), Eurostat, and Grubner (2004).
1) Percentage of total employment covered by collective agreements.
2) Union members as a percentage of the total number of employees.

(in percentages of gross earnings)

1	Hungary	5	EU8	9	Euro area
2	Poland	6	Lithuania	10	Estonia
3	Czech Republic	7	Slovenia		
4	Latvia	8	Slovakia		

Source: Eurostat.
Note: Data for Estonia refer to 2002 and data for Slovenia to 2003.

by unions. Union density – measured as union members as a percentage of all salaried workers – is significantly lower in the EU8 than in the euro area, although, as shown in Table 9, unionisation rates vary considerably among the EU8, ranging from as low as around 17% in Estonia to almost 80% in Slovenia. However, even in countries where the union density is low, collective agreements can cover a large share of workers. Therefore the number of workers, unionised or not, whose pay and working conditions are determined by collective agreements provides useful additional information. In almost all EU8 countries less than 40% of employees have wages determined by collective agreements, reflecting a generally rather decentralised wage bargaining process. The clear exception is Slovenia, with a highly centralised wage bargaining system and a collective bargaining coverage of 97%. It is worth noting that collective bargaining coverage is also significantly lower in the EU8 than in the euro area, where it exceeds 60% in all countries except for Ireland (44%).

Finally, the tax wedge, defined as the gap between the cost of labour costs to the employer and corresponding net pay, is an important factor affecting labour supply decisions, as it may create a disincentive to take up work. This effect is especially pronounced for low-paid

workers and new entrants to the labour market. Chart 12 presents tax rates for low-income earners in the EU8, together with the euro area and the EU15 averages. In 2004 the average tax burden in the EU8 countries stood at 40.4% and was significantly higher than in the euro area. Only Slovakia and Estonia had tax rates for low-income earners below the euro area average.

4 INVESTMENT AND CAPITAL ACCUMULATION

Investment growth is likely to play a prominent role in the ongoing catching-up process of the EU8 countries. It is expected to have a strong impact on potential growth, not only through capital deepening but also due to the impact it can have on productivity growth by promoting innovation and enhancing the international distribution of knowledge. The purpose of this section is to review the main determinants and the prospects for capital accumulation in the EU8 countries. The section starts by reviewing some theoretical aspects of the link between capital accumulation and growth. This is followed by a review of stylised facts on gross fixed capital formation developments in the EU8 countries. The section then continues by reviewing, for the EU8 countries, some of the determinants of investment rates commonly identified in the literature as well as some evidence concerning the human capital accumulation in the EU8 countries. Finally, it provides an overview of recent developments in FDI in the EU8 countries and briefly investigates the role of FDI as a tool to support investment and growth.

4.1 GROWTH AND CAPITAL ACCUMULATION – THEORETICAL ASPECTS

Neoclassical models attach great importance to the accumulation of physical capital for convergence across economies at different levels of development. In these models some part of the domestic capital accumulation should be financed with domestic savings, i.e. current consumption should be sacrificed

for the purpose of increasing production capacities. Another part of the capital should come from abroad (in the form of FDI or other capital flows). In a world of mobile capital flows one should observe a flow of capital from places where it is abundant (i.e. countries with higher per capita income) to places where capital is scarce (i.e. countries with lower per capita income) and consequently the rate of return on capital is higher. This movement and the capital accumulation in the lower-income country should, in the absence of frictions, theoretically continue until the income difference disappears.

Besides physical capital, technological change also plays a crucial role in ensuring continuous growth in per capita income in the long run. Most studies suggest that technological change affects productivity mainly by improving the quality of machinery and equipment, which implies that it is closely related to physical investment. For instance, DeLong and Summers (1991) have argued that countries with the highest growth rates tend to be those in which equipment investment has been the highest, and in which the relative price of equipment has fallen the fastest.[34] Mankiw (1995) has also shown that cross-country variations in the rate of capital accumulation help to explain cross-country variations in growth. Cross-country differences in physical capital investment are in turn likely to be affected by a wide range of structural and institutional factors (see for example Nicoletti and Scarpetta, 2003, and Alesina et al., 2003). Variables such as the rate of exit and entry of firms, the rate of introduction of new products, the flow of patents, and tax credits or R&D grants have been shown to affect per capita growth rates in the long run.

Although generation of knowledge is generally seen as an important factor for sustainability of economic growth, it appears to be less crucial when it comes to explaining per capita income differences across countries in the long run. Knowledge and ideas can travel around the world fairly quickly, and even when a firm has a monopoly power over an innovation, this is

only a temporary phenomenon. Hence, it has been suggested that differences in per capita income levels may be explained by the extent to which countries take advantage of knowledge through investment in human and physical capital.

Human capital accumulation is in the empirical literature often approximated by educational attainment levels and can be regarded as a complement to capital accumulation and innovation. Because human and physical capital are complementary production inputs, a shortage of human capital would help to explain why available technology does not flow from relatively rich to relatively poor countries (see Acemoglu and Zilibotti, 2001, and, with regard to the EU8 countries, Tondl and Vuksic, 2003).[35]

Another factor which is often mentioned as an important driver of investment and economic growth is FDI. This is consistent with the finding that TFP is the main driver of growth (as discussed in Chapter 2.2), as FDI is expected to influence above all TFP.

FDI typically encourages the internationalisation of production and thus increases the trade openness of an economy, which is believed to have a positive impact on growth.[36] FDI increases competitive pressures in markets and stimulates technology and knowledge transfers and innovation. In this respect, FDI supports the diffusion of foreign technology. Furthermore, FDI can provide financial sources which may sometimes be scarce in the recipient countries and thus ease credit constraints that may limit investment. Altogether, these aspects of FDI are likely to improve the host country's long-

34 The concept of the user cost of capital, representing the dynamic decision problem of firms, was first introduced by Jorgenson (1963).
35 Tondl and Vuksic (2003) suggest that higher growth rates in the capital cities of the EU8 is partly due to those regions' endowment with a more qualified workforce.
36 For instance, Frankel and Romer (1999) find empirical evidence of this effect, but some controversies with regard to its significance and magnitude exist in the literature – see for example Rodrik et al. (2004).

term growth prospects (see for example Lim, 2001, and OECD, 2002e).[37]

In the context of analysing FDI effects on domestic productivity, a lot of attention has been paid to the indirect effect of FDI on productivity through technology or productivity spillovers from foreign-owned firms to domestic firms and therefore on GDP growth. These spillovers can take place both within an industry (horizontal spillovers), for example, via the imitation of foreign companies' technology by domestic firms, or between industries (vertical spillovers), via the transfer of technology to domestic sub-suppliers or customers in the production chain. Through productivity spillovers, FDI can have multiplier effect and increase overall productivity of the host economy. Several studies have estimated these spillovers (see Gersl et al. for an overview). While most find that such spillovers have taken place, their importance and size vary across countries and seem to depend on various characteristics of the firms, industry and country ("conditional" spillovers).

4.2 RECENT DEVELOPMENTS IN INVESTMENT RATES IN THE EU8 COUNTRIES

For the period from 1996 to 2005, the share of investment in GDP has been higher in most

EU8 countries than in the euro area (see Chart 13). This can be explained by the relative scarcity of capital in the EU8 compared with the euro area, which suggests that high investment ratios might be necessary for the EU8 countries to catch up.

In the period from 1996 to 2005 (Chart 13) the development of investment ratios showed large differences between countries. In Estonia, Latvia, Lithuania, Hungary and Slovenia investment rates increased markedly, reaching between 26% and 34%. By contrast, the investment ratio of Poland decreased further to 20% from already a relatively low level, the investment ratio of the Czech Republic stagnated at a fairly high level (33%), while that of Slovakia decreased substantially to 26% from a similarly high level. Both the Czech Republic and Slovakia experienced in this period a belated restructuring of the banking sector,[38] which

37 A recent study has found that FDI generated, on average, three-quarters of the economic growth registered in 13 central and eastern European countries during the period 1994-2002 (see Deutsche Bank Research, EU Monitor, Reports on European Integration No 26/2005).
38 In both countries the banking sector was initially privatised by the voucher method (distributing small shares in state-owned companies among the population), leaving a large controlling stake in the largest banks with the state. The result of this type of privatisation was a weak banking sector with soft lending practices, a large scale misallocation of resources, and repeated bailouts by the state.

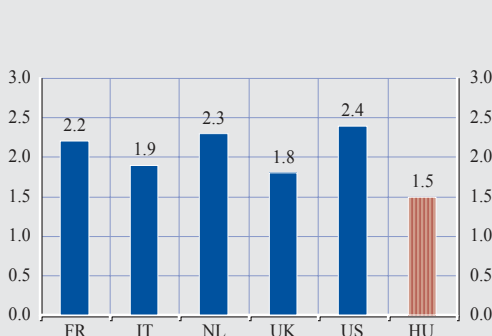**Chart 13 Ratios of gross fixed capital formation to GDP**

(in percentages)
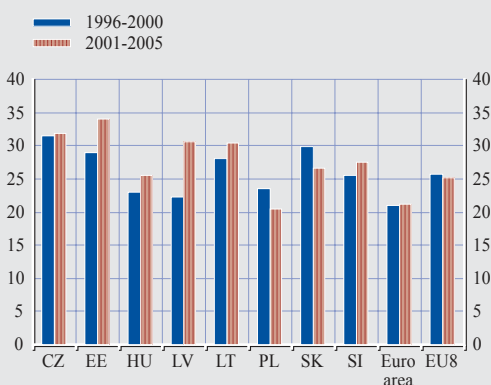
Source: European System of Accounts 1995.

Chart 14 Comparison of net capital stock/output ratios

(in percentages)

Source: Pula (2003).
Note: Data for Hungary are for 1999; for all other countries data are for 1992.

temporarily reduced corporate lending and contributed to the decrease in the investment ratio. In the long run, however, it improved the allocation of resources and supported the catching-up process.

Unfortunately, it is very difficult to say how far on the EU8 countries are in the process of catching up with the EU15 countries in terms of capital intensity because of the lack of comparable cross-country data on capital stocks in the EU8. However, the few studies that are available suggest that the gap is still substantial. For example, Pula (2003), investigating the case of Hungary, suggests that the net capital stock to output ratio is substantially lower in Hungary than in other EU countries or the United States.

Another paper, on Poland (Piatkowski, 2003), compared average shares of information and communications technology (ICT) and non-ICT capital in GDP and found that for Poland the share of ICT capital reached only half of the EU level. In addition to the sporadic empirical evidence on capital stocks, the still substantial difference in per capita income levels[39] (partly stemming from different capital intensities) and the higher return on capital in the EU8 countries suggest that the gap in capital intensity is still far from being closed.

4.3 DETERMINANTS OF INVESTMENT RATIOS

There are two main supply-side determinants of investment ratios: profitability and the cost of capital.[40] With regard to profitability indicators, although theory suggests that investment decisions are predominantly based on expected future profitability, current profitability figures are often used as a proxy in the empirical work.[41] Using data based on the European System of Accounts 1995 (ESA 95), the profit share (the ratio of operating surplus to GDP) was calculated for the EU8 countries (Chart 15). The profit share of most EU8 countries increased over the period from 1996 to 2005, and in 2005 it varied between 23% in Slovenia and 46% in Slovakia. The increasing

Chart 15 Ratios of gross operating surplus to GDP

(in percentages)

■ 1996
▦ 2005
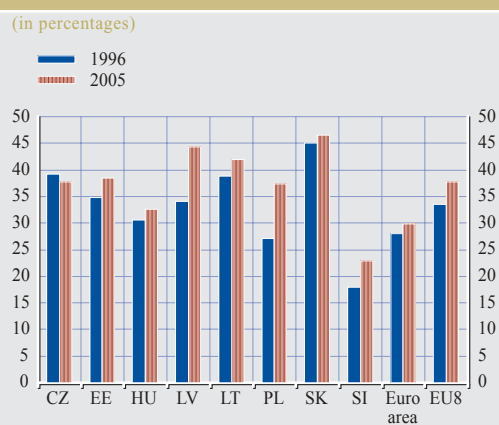
Source: ECB.

profitability of investments in the EU8 is likely to have supported capital accumulation.[42]

Stock market valuations are an alternative measure of profitability[43]. These measures are often used as a proxy for profitability expectations, reflecting the forward-looking nature of investment decisions. In the six EU8 countries for which stock indices are available, the indices generally showed a very strong increase in 1996-2005, even in periods in which real GDP growth was slowing. While this investment boom is in part likely to have been

39 See Section 2.1.
40 While changes in aggregate demand are likely to have a strong cyclical effect on investment growth they cannot explain changes in investment ratios. Our analysis therefore focuses on changes in profitability and the cost of capital.
41 In any case, looking at profitability at an aggregate level is likely to involve a wide range of measurement problems. Therefore, caution should be exercised when such data is used. For further details on these issues see ECB (2004).
42 However, under some circumstances a temporary decrease in the profit share can also lead to higher investment. In Hungary, for example, the profit share has declined slightly in the past few years as a result of private sector wage growth considerably exceeding productivity growth. This triggered an adjustment in the corporate sector that has been substituting capital for labour. While this form of adjustment is likely to support GDP growth via capital deepening and higher future productivity growth, some part of the effect is offset by lower labour utilisation.
43 Stock market performance should be interpreted with caution as an indicator of profitability in the EU8 countries, given the small capitalisation of EU8 stock markets and the fact that the small number of companies listed on the stock exchanges are not necessarily a good proxy for the whole economy in these countries.

Chart 16 The real cost of capital in the EU8, differential with the euro area

(in percentage points)
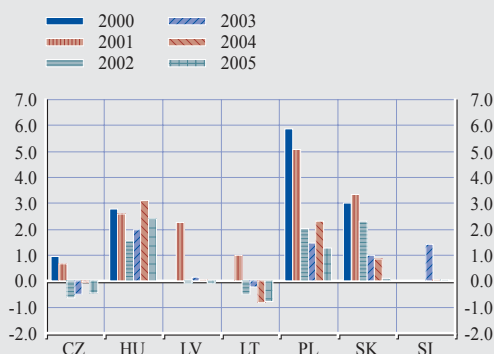
Source: European System of Accounts 1995, European Commission and ECB staff calculations.
Note: No real cost of capital figure was calculated for Estonia, due to the lack of comparable long-term interest rate figures. This is because Estonia does not have a developed market for long-term fixed-interest rate debt securities denominated in Estonian kroons.

liquidity-driven, it is also likely to reflect the confidence of international investors in the profitability of large corporations in the EU8 countries.

Turning to the cost of capital, the simplest measure contains three major elements: the financial costs arising from the ownership of the capital stock, the changes in the price of the capital stock and the losses due to the depreciation of the capital stock. The cost of capital for the EU8 countries can then be approximated using the following simple formula:

$$C_k = P_I * (R - dlog(P_I^e) + \delta)/PGDP,$$

where Ck is the real cost of capital, R is the nominal long-term interest rate, P_I is the investment price deflator, $dlog(P_I^e)$ is the expected change in the investment price deflator, δ is the physical depreciation rate of capital and PGDP is the GDP deflator.[44]

Calculations for the period 2000 to 2005 suggest that the gap between the cost of capital in the EU8 countries and the euro area was initially decreasing in all EU8 countries, although in

Hungary and Poland it increased somewhat again in 2004 (see Chart 16).[45] When the cost of capital was falling in both the euro area and the EU8, the decrease was larger in the EU8 countries. The key reason for the overall drop in the cost of capital was the decrease in borrowing costs, which are proxied here by long-term interest rates. The convergence of long-term interest rates with euro area rates has in turn to a large extent reflected the reduction in the country risk premium, caused by the decrease in macroeconomic uncertainty due to the process of nominal convergence of the EU8 countries with the euro area. In particular, the disinflation process in several EU8 countries played a key role in the decrease in long term interest rates. Moreover, the borrowing costs in the EU8 have been influenced by the increase in competition and efficiency in the banking sector. The rise in the cost of capital in 2004 in the larger EU8 countries reflected rising macroeconomic uncertainties owing to fiscal imbalances and re-accelerating inflation rates.[46] Overall, however, the decrease in the cost of capital in general and the fall in borrowing costs in particular are likely to have supported investment growth in the EU8 countries.

4.4 THE INSTITUTIONAL ENVIRONMENT IN THE EU8 COUNTRIES AND INVESTMENT

As discussed in Section 4.1, institutional factors, such as product market regulations, might have a strong impact on the pace of capital accumulation. However, the impact of the regulatory environment strongly depends on the concrete measures taken. Some product market regulations can actually lead to higher

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44 The advantage of this formula is that it can be easily applied to macro data. Its shortcomings are that it does not take into account the cost of equity capital and tax changes. See European Commission (2001).

45 The cost of capital was not calculated for earlier years due to data limitations.

46 Another measure of the cost of capital is the relative price of capital, proxied by the ratio of the deflator of gross fixed capital formation to the GDP deflator. This indicator of the relative price of capital decreased in all EU8 countries because investment goods inflation was below that final goods inflation in the period 1996 to 2004, adding to the downward impact of nominal convergence on the cost of capital (see Katay and Wolf, 2004).

Table 10 The Fraser Institute indicators on the administrative burden in EU8 and the euro area in 2004

	Price controls	Burden of regulations	Time with government bureaucracy	Starting a new business	Irregular payments	Business regulations	Regulation
Czech Republic	7.0	3.1	8.8	5.0	6.3	6.0	6.4
Estonia	6.0	5.2	7.3	7.1	7.8	6.7	7.3
Hungary	6.0	3.2	9.7	6.5	7.3	6.6	7.3
Latvia	6.0	3.8	6.9	6.8	5.8	5.9	6.7
Lithuania	6.0	3.1	6.3	5.8	6.9	5.6	6.4
Poland	3.0	2.8	7.0	5.4	5.5	4.8	5.9
Slovakia	6.0	2.9	7.4	6.8	6.3	5.9	6.8
Slovenia	4.0	2.9	6.3	4.9	7.8	5.2	6.3
EU8	5.5	3.4	7.5	6.0	6.7	5.8	6.6
Euro area	6.3	3.5	7.3	6.2	8.0	6.3	6.5

Source: Fraser Institute.
Notes: All index values are between 1 and 10, and higher values mean better regulations. The dark cells represent parameters where a particular EU8 country has reached or exceeded the euro area average.

capital accumulation and investment ratios but at the cost of a deterioration in the efficiency with which capital is allocated. By contrast, the paper by Alesina et al. (2003) provides robust empirical evidence suggesting that lowering entry barriers can lead to higher capital accumulation.

Unfortunately there is no standardised way to measure the regulatory burden in a country, and all measures used to compare regulations in different countries should be considered with due caution. One way is to compare the administrative burdens in the EU8 and the euro area on the basis of indicators published by the Fraser Institute (see Table 10). The tentative conclusion that can be drawn is that the business environment in the EU8 has improved significantly over the past few years; however, on average it has still not reached the level of the euro area countries. This implies that new businesses in the EU8 countries generally still face a larger administrative burden than their counterparts in the euro area. However, there are significant differences between the countries. Estonia and Hungary, in particular, appear to be outliers. In both countries four out of seven indicators suggest a more business-friendly environment than in the euro area.

Another piece of evidence on the change in the institutional environment in the EU8 is the OECD's country score index on barriers to trade and investment, which is available only for the four largest EU8 countries. Comparing figures in 1998 and 2003 suggests that barriers to trade and investment decreased both in the euro area and the four EU8 countries for which these scores are available. On average, however, these barriers still tended to be higher in the four EU8 countries than in the euro area in 2003 (see Table 11).

In summary, the institutional environment in the EU8 appears to have become generally more business-friendly in recent years. However, in most parameters the EU8 countries have not yet reached the standards of the euro

Table 11 Barriers to trade and investment, country scores

	Barriers to trade and investment	
	1998	2003
Czech Republic	3.1	0.9
Hungary	1.9	1.4
Poland	4.3	2.4
Slovakia	-	1.6
EU4	3.1	1.6
Euro area	1.2	0.7

Source: OECD.

area economies. Further improvement in the business environment, in particular a decrease in administrative burdens and barriers to trade and investment, thus seems important for growth and capital accumulation.

4.5 THE HUMAN CAPITAL ENDOWMENT OF THE EU8 COUNTRIES

While accumulating physical capital is essential to the catching-up process in the EU8, it does not guarantee success. It is at least as important for the EU8 countries to improve the efficiency of the use of capital (and labour). Higher efficiency in the use of inputs can be achieved by investment in "knowledge," which can be defined as investment in R&D and higher education.

The fact that none of the EU8 countries are yet world leaders in technology yet does not mean that investment in knowledge is not essential for their catching-up process. R&D is far from being important only for countries at the technology frontier. Indeed, the distance of the EU8 from the world leaders in technology implies that for many years the adoption of foreign technologies should play a key role in their development. The diffusion of foreign technologies can take place through various channels, primarily through FDI (see Section 4.6) or trade. However, the diffusion of foreign

technologies is not automatic. It requires a well educated labour force, a network of scientists who can apply and perfect foreign technologies, and a business environment supportive of innovation. Moreover, investment in these non-tangible factors is also essential if the EU8 countries are to adjust their production structure and increase the share of higher value added goods and services.

Where do the EU8 countries currently stand in investment in knowledge, and what does this imply for their growth prospects? Public spending on education as a percentage of GDP in the EU8 countries suggests a fairly favourable picture. For most of the EU8 countries this ratio is above the euro area average. Moreover, in some countries, such as Hungary and Poland, it has been increasing significantly over time (see Table 12).

Another indicator of the human capital endowment of the EU8 countries is the share of 20 to 24 year old population that completed at least secondary education. In all EU8 countries this share is above the euro area average, and the EU8 average in 2005 was more than 10 percentage points above the euro area level (see Chart 17). This relatively high level suggests that the EU8 countries have a good basis on which to become a location for skill-intensive economic activities.

Table 12 Total public expenditure on education as a percentage of GDP

	1996	2003	2003/1996
Czech Republic	4.68	4.51	96%
Estonia	6.05	5.43	90%
Latvia	5.14	5.32	104%
Lithuania	5.18	5.18	100%
Hungary	4.51	5.85	130%
Poland	4.67	5.62	120%
Slovenia	-	6.02	-
Slovakia	4.53	4.34	96%
EU8	4.97	5.28	106%
Euro area	-	5.02	-

Source: Eurostat.

Chart 17 Percentage of 20 to 24 year-olds with at least secondary education, 2005

1	Czech Republic	5	Hungary	9	EU8
2	Estonia	6	Poland	10	Euro area
3	Latvia	7	Slovenia		
4	Lithuania	8	Slovakia		
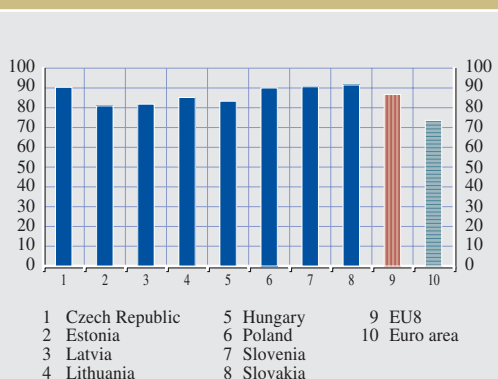
Source: Eurostat.

Table 13 Gross expenditure on R&D as a percentage of GDP			
	1996	2004	2004/1996
Czech Republic	0.97	1.26	130%
Estonia	-	0.88	-
Latvia	0.42	0.42	100%
Lithuania	0.5	0.76	152%
Hungary	0.65	0.88	135%
Poland	0.65	0.56	86%
Slovenia	1.35	1.45	107%
Slovakia	0.92	0.51	55%
EU8	0.78	0.84	108%
Euro area	1.8	1.86	103%

Source: Eurostat.

However, quantitative indicators on education only capture part of the truth. Looking beyond the numbers suggests that there is still scope for improving the responsiveness of education to market demand in the EU8. In fact the secondary education systems of most of the EU8 countries still place too much emphasis on passive learning instead of enhancing skills which can be adapted to changing circumstances[47].

Turning to investment in R&D, the picture is fairly mixed. The first key indicator to look at is the gross expenditure on R&D (GERD) as a percentage of GDP. While there is no linear relationship between the level of this variable and economic growth, international evidence suggests that a rising GERD/GDP ratio is usually accompanied by an increase in economic development.[48] Looking at the EU8 countries, it is not encouraging that GERD in 2004 was in all EU8 countries below that in the euro area and was on average less than half of the euro area figure (which itself needs to catch up with the world's technology leaders). Furthermore, only two EU8 countries (the Czech Republic and Slovenia) spent more than 1% of their GDP on R&D activities. However, the spending on R&D had increased substantially in a number of EU8 countries (see Table 13).

A possible consequence of the relatively low R&D expenditure in the EU8 countries is the very low number of patent applications from these countries to the European Patent Office compared with the euro area average.[49] It is interesting to note, however, that since 1996 Hungary (despite relatively low R&D expenditure) and in particular Slovenia manage to consistently record double-digit numbers of patent applications per million inhabitants (see Table 14).

The relatively low R&D spending and the low number of patents from the EU8 can be partly explained by looking at the sources of R&D financing in these countries. It is striking that in 2000 industry on average already played a much smaller role in the financing of R&D in the EU8 (39% of total R&D spending) than in the euro area (around 57%). The gap increased over time, with the role of industry decreasing
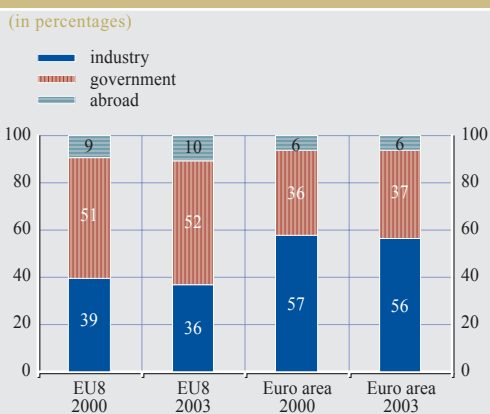
47 See Feldmann (2004).
48 Török (2005).
49 The picture is similar in the case of patent registrations at the United States Patent and Trademark Office.

Table 14 Number of patent applications to the European Patent Office per million inhabitants								
	1996	1997	1998	1999	2000	2001	2002	2003
Czech Republic	6	7	10	11	10	11	12	16
Estonia	6	5	5	8	11	11	8	16
Latvia	3	4	4	2	7	5	6	6
Lithuania	1	1	0	1	2	2	3	6
Hungary	10	12	12	17	20	18	19	19
Poland	1	1	2	2	3	3	5	4
Slovenia	19	18	25	22	36	29	52	50
Slovakia	4	4	4	5	7	4	8	3
EU8	4	4	4	5	7	4	8	8
Euro area	109	123	135	149	159	161	158	163

Source: Eurostat.

Chart 18 Sources of R&D financing

(in percentages)

- industry
- government
- abroad

Source: Eurostat.

companies. These companies prefer to carry out most of their R&D activities at their headquarters.[50] At the same time the SME sector often lacks the means of financing R&D activities. A greater involvement of the SME sector in R&D activities and better financing opportunities for these activities would thus appear to be beneficial for the growth prospects of the EU8.

An issue closely related to the financing of innovation in the SME sector is the involvement of venture capital.[51] Venture capital generally plays a prominent role in identifying and financing viable projects of small, innovative enterprises in the high-tech sectors. The role of venture capital can be especially vital in the case of start-ups in new industries, where the risk (and also the potential reward) is unusually high. Data on the involvement of venture capital available for the four larger EU8 countries (the Czech Republic, Hungary, Poland and Slovakia)

in the EU8 to around 36% of total R&D financing in 2003, while it remained stable at around 56% in the euro area (see Chart 18). The role of industry in R&D financing in the EU8 appears even weaker if one considers that even in the euro area it plays a smaller role than in the United States or Japan, at 63% and 74% respectively. The relatively low involvement of industry can be explained by the fact that the large export-oriented sector in a number of EU8 countries is dominated mainly by foreign
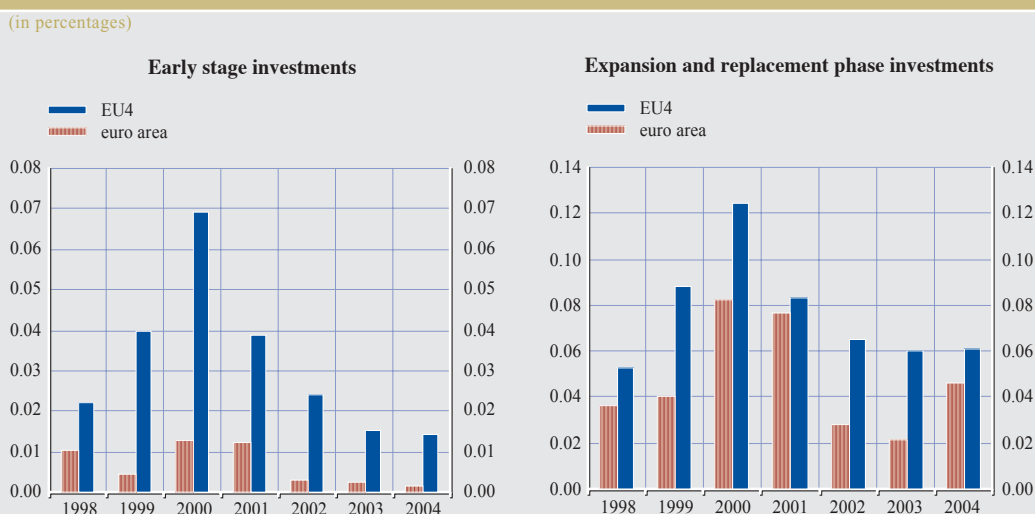
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50 While overall in the EU8, higher GERD would help to boost economic growth, the example of Ireland suggests that in a country with an FDI-based strategy, fast catching up is possible even with a below-average research intensity.
51 Venture capital is a term used for specialised financial institutions playing the role of intermediary between firms that are in need of financing and the primary sources of financing (banks and pension funds).

Chart 19 Venture capital investments relative to GDP by investment stages

(in percentages)

Early stage investments

- EU4
- euro area

Expansion and replacement phase investments

- EU4
- euro area

Source: Eurostat.
Note: EU4 refers to the average of figures for the Czech Republic, Hungary, Poland and Slovakia.

show a much smaller share of project financing than in the euro area, especially in the case of early stage projects (see Chart 19). The share of high-tech sectors (for example information and biotechnology) in total venture capital investments is fairly large in the Czech Republic, Hungary and Poland (around 50%), while in Slovakia it is only around 25%.[52]

While government involvement can play an important role in supporting innovative enterprises, the solution to the apparent problem of financing of R&D activities in most EU8 countries is more complex. Traditionally, some part of the R&D financing is government responsibility, in particular basic research with

a highly unpredictable rate of return. However, in the case of applied research governmental involvement often distorts economic incentives and the public sector lacks the knowledge to select the most commercially viable projects. The key to success is thus not only to increase the GERD/GDP ratio but also to ensure the most efficient allocation of recourses, which in turn requires well-functioning financial markets. Providing financial markets and more generally the business sector with the right incentives to become involved in R&D activities thus appears to be the key means of improving the innovation potential of EU8 countries.

52 OECD (2005).

THE POSSIBLE IMPACT OF EU COHESION POLICY ON GROWTH IN THE EU8 COUNTRIES[1]

EU cohesion policy aims to improve the long-term growth and employment prospects of EU countries and regions that are in a catching-up process, including the EU8 countries. This is mainly done by co-financing infrastructure and human capital investments and by the provision of financial support for investments in other main determinants of growth and convergence.

For the period 2004 to 2006 the EU8 countries (plus Cyprus and Malta, which receive only very limited funds) received in total €21.8 billion in the context of the EU cohesion policy (at 1999 prices). From 2007 onwards, however, the level of support will increase considerably, to 3% or 4% of GDP per annum.

Two main types of evaluations have been used to answer the question of whether EU cohesion policy has a significant impact on growth and convergence in the supported countries and regions. First, an increasing body of literature has tried to analyse the impact of cohesion policy funding using standard tools of empirical growth analysis such as Barro/Sala-i-Martin-type β-convergence regressions. The results tend to be rather mixed, although some papers find that the EU funds can contribute positively to convergence in EU regions.

Second, a number of macroeconomic models are used to assess the impact of cohesion policy. The results of these evaluations differ considerably, depending on the model specifications. The HERMIN models introduce the effect of the funds as expenditure and income shocks and via policy externalities (through increased TFP, increased attractiveness for FDI and enhanced competitiveness of endogenous industries). The long-term annual supply-side effects estimated by HERMIN for the main recipient countries and regions in the EU15 are considerable (1-2 percentage points of real GDP growth per year).[2] The European Commission's QUEST II model

1 A more in-depth discussion on this issue can be found for example in European Commission (2004), pp. 89-101.
2 This should be interpreted as an increase in potential growth for the supported areas after the financial support has been terminated.

introduces the impact of cohesion policy as an increase in the public capital stock, which in turn impacts on a neo-classical production function. Real interest and exchange rates are determined endogenously to control for possible crowding-out effects. The QUEST II simulation results for the main EU15 recipient countries thus tend to be lower than the HERMIN simulations but still suggest an increase in potential growth of between 0.5-2 percentage points per annum due to the effects of EU cohesion policy.

Overall, these evaluations suggest that EU cohesion policy can have a positive impact on long-term growth and real convergence in the EU8 countries. In fact, given that infrastructure and human capital investment needs in these countries tend to be larger than in the benefiting countries and regions in the EU15, it is possible that the leverage effects of EU cohesion policy may be somewhat larger than in the past. However, the complex administrative procedures involved in the operation of EU cohesion policy can create problems for national administrations lacking the necessary capacity. The EU8 countries are likely to encounter this problem more frequently than the EU15, at least for another couple of years. Furthermore, they may at times be unable to provide the necessary national co-financing to match EU cohesion policy funding, particularly should a country be facing severe fiscal adjustment challenges.

More generally, it is important to keep in mind that cohesion policy can only exert a positive impact on real convergence if the supported countries have a stable macroeconomic environment and institutional and microeconomic structures that are conducive to growth. Moreover, a careful selection of the projects to be supported by cohesion policy funding is essential if the potential benefits for long-term growth are to be realised.

4.6 RECENT FDI DEVELOPMENTS IN THE EU8 COUNTRIES

There is a growing view that FDI has favourable effects on growth in the host economy. As discussed at the beginning of the section, FDI can be viewed as supportive of investment and growth primarily in two ways. On the one hand, it acts as a catalyst for technological progress and boosts productivity via technology and knowledge spillover. On the other hand, it provides financial resources and hence facilitates investment.[53]

The EU8 countries have received substantial FDI inflows since the early stages of their transition. Annual FDI inflows averaged around 5% of GDP between 1995 and 2005, although the pattern varied considerably across countries (Chart 20). Overall, FDI inflows remained strong in the EU8 throughout the last decade and in 2005 amounted to 4.8% of GDP (€26 billion).
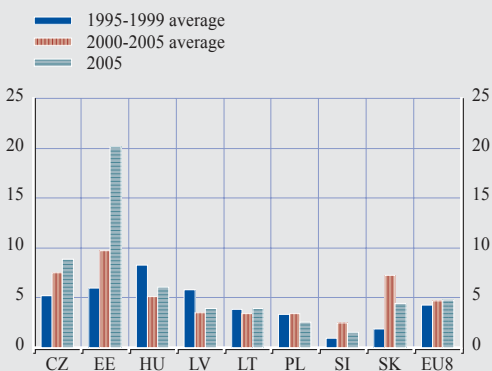
In line with strong FDI inflows, inward FDI stock has been growing fast in most EU8 countries (Chart 21). Inward FDI stock in the EU8 grew to 30% of GDP in 2000 and further to 43% of GDP (€211 billion) in 2005. Estonia experienced the largest accumulation of FDI (above 90% of GDP), followed by Hungary and the Czech Republic. In Latvia, Lithuania, Poland, Slovenia and Slovakia, however, FDI has been more moderate. This has resulted in inward FDI positions below the EU8 average, the lowest being in Slovenia (22% of GDP in 2005).

In absolute terms, as expected, larger countries have attracted more FDI, with the Czech Republic, Hungary and Poland accounting for about 80% of inward FDI stock in the EU8.

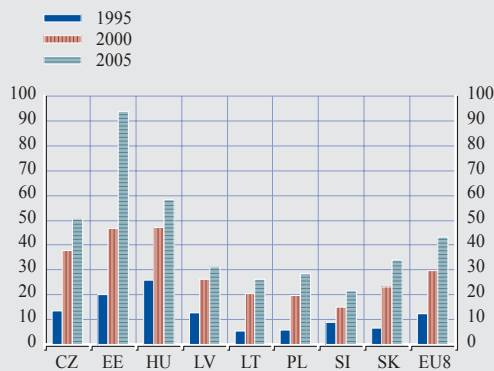53 One should note that FDI also includes loans between affiliated firms.

Various factors have shaped FDI accumulation in the EU8, with EU accession prospects and privatisation being among the main drivers. Privatisation was a major factor in particular during the 1990s. Indeed, differences in the timing of privatisation and the degree of openness to foreign investment help to explain differences in FDI positions from country to country.[54] More recently, other determinants of FDI, such as cost factors, the size of the market and its location, overall political and macroeconomic stability, and FDI policies, have gained in importance.

Turning now to the sectoral developments, the services sector has received the majority of FDI inflows in the EU8. Around 50% of the total inward FDI stock is in services sectors, in particular financial intermediation, trade, real estate and transport, while around 40% is in manufacturing (Chart 22). FDI in the services sector is usually motivated by market seeking and supply cost optimisation and thus counts towards "horizontal" FDI, even though outsourcing and FDI in export-oriented services seem to have become an important factor recently. The bulk of FDI in services can be linked to privatisation in these countries, as for example foreign investors took over a large proportion (in some countries the majority) of the banking and telecommunications sectors

during the 1990s. FDI in manufacturing, on the other hand, is usually motivated by low input costs and production cost economisation, and thus typically counts towards "vertical" FDI. However, as FDI in manufacturing has also been driven by privatisation, the motivation was often first to serve domestic markets but may have afterwards led to expanding business activity for the investing firms due to cost savings and increased competitiveness.

In the manufacturing sector, available data suggest that foreign investment activity has been concentrated in a few industries, notably in transport equipment, electrical and optical equipment, food, chemicals and metals, which have received around two-thirds of the FDI in manufacturing (Chart 23). Transport equipment has gained in importance in recent years (together with the metal industry), which may indicate the creation of "manufacturing export platforms" in these industries. By contrast, FDI in the food industry has become relatively less important, as this has mostly related to privatisation and the buying of existing firms and less to relocation.
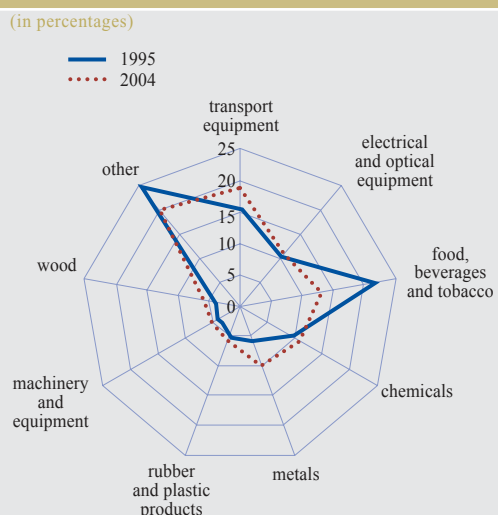
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54 For instance, Poland has been found to be more restrictive than the Czech Republic and Hungary (OECD, 2003).

Chart 22 Inward FDI stock in the EU8 by economic activity, 2004

(in percentages)
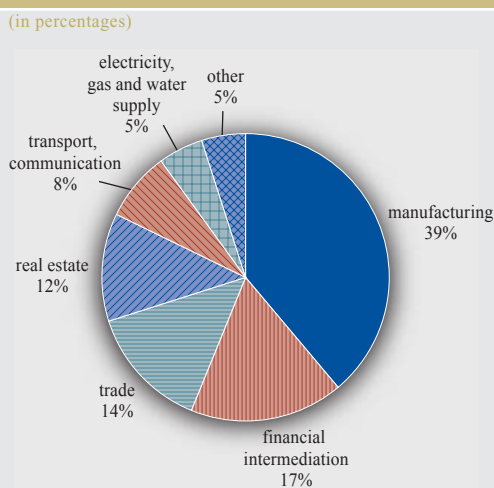
Source: Vienna Institute for International Economic Studies (wiiw).

Chart 23 Inward FDI stock in the EU8 by manufacturing industry

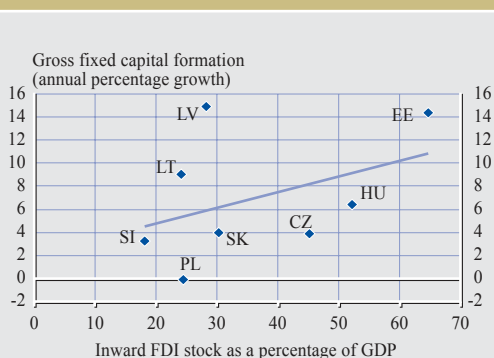(in percentages)

— 1995
···· 2004

Source: Vienna Institute for International Economic Studies (wiiw).

In this respect, it should be noted that in the largest EU8 countries the industries that have received the most FDI (transport equipment and electrical and optical equipment) are also the industries with the strongest industrial production, which is export-oriented. This tentatively suggests a positive correlation between FDI and domestic activity.

Looking at FDI and investment in the EU8 countries, FDI seems to have complemented domestic investment over 2000-05. In this period, FDI inflows averaged 21% of gross fixed capital formation (GFCF) in the EU8, and ranged between 10% (in Slovenia) and 36% (in Estonia).[55] A simple correlation analysis (Chart 24) suggests that countries that have received more FDI have built up their capital stock in recent years more rapidly, with Latvia and Lithuania being outliers, as investment growth in these two countries was the highest among the EU8, while their FDI inflows were among the lowest.

5   CONCLUSION

After the severe economic recession in the aftermath of the collapse of the centrally planned economic systems in the EU8 countries at the beginning of the 1990s, these countries embarked on a fast growth path. Their buoyant expansion was bolstered by structural and institutional reforms, macroeconomic stabilisation, the prospect of EU membership

Chart 24 Inward FDI stock (2005) and Gross fixed capital formation (2000-05 average)

Source: ECB staff calculations based on ECB data and the wiiw database.

55 Some argue that FDI crowds out domestic investment. Even if this is to some extent the case, the positive impact of FDI seems to have prevailed in this period. However, with the expansion of the sample the relationship between FDI and investment becomes weaker and even negative in some countries.

and actual accession to the EU in May 2004. As a result, all EU8 countries have managed to increase their relative level of per capita income vis-à-vis the euro area in recent years, although the gaps remain quite large for many of them. Improvements in labour productivity, to a large extent attributable to TFP growth, have been the main driver of the catching-up process in the EU8 countries. Labour utilisation, by contrast, has deteriorated in most countries. This finding is broadly in line with the findings of other studies in this field and consistent with the expected effects of the far-reaching economic transformation that has taken place in the EU8 countries during the period covered in this paper.

Looking at the labour market situation in the EU8 countries, it emerges that the still ongoing process of sectoral transition from agriculture and industry to services has been accompanied by an increasing degree of mismatch between labour supply and job vacancies. The indicators presented on educational attainment confirm that the adaptability of the workforce has not been sufficient to meet the changed labour requirements resulting from the rapid sectoral shift, i.e. the higher demand for skilled workers. This has already created labour market bottlenecks in some countries and sectors, which may be further aggravated by increased east-west migration within the enlarged EU. If not appropriately addressed, such labour market bottlenecks are likely to lead to increasing wage pressure and ultimately reduced growth and real convergence. Like skill mismatches, regional mismatches may have potentially harmful consequences for economic growth. Long lasting geographical inequalities combined with low inter-regional labour mobility may reduce effective labour supply, and therefore negatively affect potential output. In addition, demographic dynamics in the EU8 will most likely contribute to a reduction in potential labour supply in the future, which implies a negative impact on the long-term growth prospects. By contrast, labour market institutions in the EU8 countries do not appear to be overly rigid, and in many cases they can

be regarded as more flexible than those existing in the euro area countries. Empirical studies generally find that the institutional framework can at most explain only a small part of the high unemployment rates prevailing in the EU8. However, it cannot be excluded that the existing institutions have been responsible for the lack of a recovery in job creation and the rising proportion of long-term unemployment.

From a forward-looking perspective, structural policies aimed at improving the accumulation of human capital will play a crucial role in overcoming the above-mentioned labour market mismatches, in particular educational mismatches. Moreover, boosting demand for low skilled workers by changing some of the less advantageous features of the institutional framework of the EU8 labour markets, for example those relating to minimum wages, could increase labour utilisation and alleviate labour market problems over the medium term.

In sum, although the significantly lower average employment rate in the EU8 compared with the euro area suggests a considerable degree of slack in the labour market, the rapid sectoral and technological change in these countries and the associated build-up of labour mismatch indicate that the availability of labour may sooner rather than later become a bottleneck for growth in EU8 countries. The degree to which labour market bottlenecks will occur is, however, strongly country, region and sector-specific and requires a more detailed evaluation. From a forward-looking perspective, it will be of key importance for EU8 countries to develop suitable policies to reduce mismatches in order to ensure that high growth rates, which are needed to advance the real convergence process, do not result in unsustainable wage and inflation developments.

As regards capital accumulation, since 1996 most EU8 countries have experienced increasing investment ratios, driven by improved profitability and favourable changes in the cost of capital. Favourable cost of capital

developments have mainly reflected the effect of nominal convergence in the EU8 countries towards the euro area on the risk premium on long term investments. In addition, banking sector reforms, including privatisation, have led to an increase in competition in the banking sectors of the EU8, putting further downward pressure on the cost of borrowing.

Looking ahead, the few available studies on individual countries and the still substantial difference in per capita income levels suggest that the gap in capital intensity is still far from being closed. Given the relative scarcity of capital in the EU8 countries compared with the euro area and the resulting higher rate of return on capital, capital accumulation is likely to remain a key factor for real convergence in the medium run. The cost of capital has reached the euro area level in most EU8 countries; therefore little additional growth stimulus can be expected from this source. In fact, temporary increases in the cost of capital in recent years in some EU8 countries suggest that there are still significant challenges in the nominal convergence process of some economies. In particular, progress in fiscal consolidation could contribute to a further decrease in the risk premium in the EU8 countries, thereby supporting investment growth and real convergence. The institutional environment in the EU8 countries appears to have become over time generally more business-friendly. However, in most parameters these countries have not yet reached the standards of the euro area economies. Further improvement in the business environment, in particular a decrease in administrative burdens and barriers to trade and investment, thus seems important for growth and capital accumulation.

Looking at investment in human capital, the EU8 countries show a mixed picture. Some indicators of educational attainment (public expenditure on education, share of the labour force with at least secondary education) suggest a favourable situation for the EU8 countries relative to the euro area. However, other indicators – related to research input (R&D spending as a percentage of GDP) and output

(number of patent applications) suggest that the EU8 are substantially lagging behind the euro area (which itself needs to catch up with the world's technology leaders). Since the EU8 are not yet at the technological frontier, in the short term lower R&D spending does not necessarily hamper their chances of catching up. However, a certain level of R&D investment together with a well-trained workforce is needed to increase the diffusion of foreign technologies. Moreover, in the medium term it seems necessary for the EU8 countries to increase the innovation potential of their economies in order to adjust to the convergence of labour costs towards the euro area by shifting their production structure towards higher value added goods and services. From the financing side, a relatively low involvement of the business sector in the financing of R&D projects appears to be one of the key reasons behind the poor R&D performance of the EU8. This partially relates to the fact that many large companies in the EU8 countries are subsidiaries of foreign firms, which conduct their R&D activities mainly in their home countries. Moreover, financing opportunities for SMEs are often lacking, and there is insufficient involvement of venture capital investors. While government involvement can play an important role in supporting innovative enterprises, the key to success is not only to increase public R&D funding but also to ensure the most efficient allocation of recourses, which requires well-functioning financial markets. Providing financial markets and more generally the business sector with the right incentives to become involved in R&D activities thus appears to be the key means of improving the innovation potential of EU8 countries.

FDI can play an important role in the assessment of the capital accumulation and productivity growth in EU8 countries, as it is important for growth from both a technology and knowledge spill-over perspective, as well as from a financial point of view. FDI flows into the EU8 have been growing rapidly since the beginning of transition, and the FDI stock in the EU8 was almost ten times higher in 2005 than ten years

previously. FDI has been concentrated in services and two major manufacturing industries (transport and optical and electrical equipment), which have increasingly become the production and export drivers in the biggest EU8 economies.

As to the prospects for further FDI inflows, privatisation has largely ceased to be a main driver of FDI in the EU8 countries. Against this background, the institutional and business environment, as well as economic features that attract non-privatisation-related FDI, will become increasingly more important for the EU8 countries. In particular, a stable macroeconomic environment, labour costs that develop in line with productivity, the availability of skilled labour and a sufficiently developed infrastructure are needed to secure future FDI inflows.

Overall, the prospects for a continued and reasonably fast process of real convergence between the EU8 countries and the euro area are good. However, a continuation of the rapid progress made by many EU8 countries in the past can not be taken for granted. In fact, in order to ensure that fast economic growth in the EU8 countries remains sustainable, it is crucial for these economies to take appropriate policy action. First, it is important to recall that sound macroeconomic policies including credible monetary policy and appropriate fiscal policy are essential to ensure the appropriate framework conditions for further growth and convergence. Second, they need to address structural labour market problems, in particular by reducing regional and skill mismatches. Third, they must make further efforts to improve the business environment, in order to ensure that the capital accumulation process continues and R&D investments increase. Many of the above-mentioned facets of growth-enhancing policy will also help to ensure a continued inflow of FDI, which in turn is expected to help accelerate the convergence process.

REFERENCES

Acemoglu, D. and F. Zilibotti (2001), "Productivity differences", *Quarterly Journal of Economics*, Vol. 116, pp. 563-606.

Afonso, A., L. Schuknecht and V. Tanzi (2006), "Public sector efficiency. Evidence for new EU Member States and emerging markets", ECB Working Paper No 581, January.

Aghion, P. and P. Howitt (1992), "A model of growth through creative destruction", *Econometrica* 60, pp. 323-51.

Aghion, P. and P. Howitt (1999), *Endogenous growth theory*, MIT Press, Cambridge, Massachusetts.

Alesina, A., S. Ardagna, G. Nicoletti and F. Schiantarelli (2003), "Regulation and Investment", NBER, Working Paper No 9560.

Angeloni, I., M. Flad and F. P. Mongelli (2005), "Economic and monetary integration of the new Member Sates – helping to chart the route", ECB Occasional Paper No 36, September.

Backé, P., C. Thimann, O. Arratibel, O. Calvo-Gonzalez, A. Mehl and C. Nerlich (2004), "The acceding countries' strategies towards ERM II and the adoption of the euro: an analytical review", ECB, Occasional Paper No 10, February.

Barro, R. J. (*1991),* "Economic growth in a cross section of countries", *Quarterly Journal of Economics*, Vol. 106, pp. 407-443.

Barro, R. J. and J. W. Lee (1994), "Sources of economic growth", *Carnegie Rochester Conference Series on Public Policy*, Vol. 40, pp. 1-46.

Barro, R. J. and X. Sala-i-Martin (1991), "Convergence across states and regions", *Brookings Papers on Economic Activity*, Vol. 1, pp. 107-182.

Bentolila, S. and G. Bertola (1990), "Firing costs and labour demand: how bad is eurosclerosis?" *Review of Economic Studies*, Vol. 57, No 3, pp. 381-402.

Berg, A., E. Borensztein, R. Sahay and J. Zettelmeyer (1999), "The evolution of output in transition economies: explaining the differences", IMF Working Paper WP/99/73.

Blanchard, O. (2004), "The economic future of Europe", Massachusetts Institute of Technology, mimeo.

Boa, T. and K. Terrell (2002), "Institutional determinants of labour reallocation in transition", *Journal of Economic Perspectives*, Vol. 16, No 1, pp. 51-76.

Boeri, T. and H. Brückner (2000), "Study on the impact of eastern enlargement on employment and labour markets in the EU Member States", European Commission, Directorate General for Employment, Social Affairs and Equal Opportunities.

Boeri, T. and S. Scarpetta (1996), "Regional mismatch and the transition to a market economy", *Labour Economics*, Vol. 3, pp. 233-254.

Calmfors, L. and J. Driffil (1988), "Bargaining structure, corporatism, and macroeconomic performance", *Economic Policy*, Vol. 3, No 1, pp. 3-13.

Cameron, G. and J. Muellbauer (1998), "The housing market and regional commuting and migration choices", *Scottish Journal of Political Economy*, Vol. 45, No 4, pp. 420-446.

Cazes, S. (2002), "Do labour market institutions matter in transition economies? An analysis of labour market flexibility in the late nineties", International Institute for Labour Studies Discussion Paper No 140, ILO.

DeLong, J. B. and L. H. Summers (1991), "Equipment investment and economic growth", *Quarterly Journal of Economics*, 106(2), pp. 445-502.

Doyle, P., L. Kuijs and G. Jiang (2001), "Real convergence to EU income levels: Central Europe from 1990 to the long term", IMF Working Paper WP/01/146.

Dunning, J. H. (1977), "Trade, location of economic activity and the MNE: a search for an eclectic approach", in Ohlin, B., P. Hesselborn and P. M. Wijkman (eds.), *The international allocation of economic activity*.

Dunning, J. H. (1988), "The eclectic paradigm of international production: a restatement and some possible extensions", *Journal of International Business Studies*, Vol. 19. No 1.

Durlauf, S. N. and D. T. Quah (1999), "The new empirics of economic growth", in Taylor, J. B. and M. Woodford (eds.), *Handbook of Macroeconomics*, Vol. 1A, North-Holland, Amsterdam, pp. 235-308.

Ederveen S. and L. Thissen (2004), "Can labour market institutions explain unemployment rates in new EU Member States?", CPB Document No 59, April 2004.

European Central Bank (2004), "Measuring and analysing profit developments in the euro area", Monthly Bulletin, January.

European Central Bank (2006a), Convergence Report May 2006.

European Central Bank (2006b), Convergence Report December 2006.

European Central Bank (2006c), "Financial development in central, eastern and south-eastern Europe", Monthly Bulletin, November.

European Commission (2001), "Determinants and benefits of investment in the euro area".

European Commission (2002), Employment and labour market in Central European countries, No 1/2002.

European Commission (2003), "Key structural challenges in the acceding countries: The integration of the acceding countries into the Community's economic policy co-ordination processes", European Economy. Occasional Paper No 4, July.

European Commission (2004a), "Catching up, growth and convergence of the new Member States," in *The EU economy: 2004 review*, Chapter 2.

European Commission (2004b), Employment in Europe 2004.

Fidrmuc, J. (2003), "Migration and regional adjustment to asymmetric shocks in transition economies", CEPR Discussion Paper No 3798.

Fidrmuc, J. and P. Huber (2004), "The puzzle of rising regional disparities and falling migration rates during transition", Austrian Institute for Economic Research.

Fischer, S., R. Sahay and C. Vegh (1998), "From transition to market: Evidence and growth prospects", IMF Working Paper WP/98/52.

Frankel, J.A. and D. Romer (1999), "Does trade cause growth?", *American Economic Review*, Vol. 89, No 3, pp. 379-399.

Gersl, A, Rubene, I. and Zumer, T. (2007), "Foreign direct investment and productivity spillovers in the Central and Eastern European countries", mimeo.

Golub, S. (2003), "Measures of restrictions on inward foreign direct investment for OECD countries", OECD Economic Studies No 36.

Gruber, T. (2004), "Employment and labour market flexibility in the new EU Member States", in Focus on European Economic Integration 1/2004 pp. 96-121, Oesterreichische Nationalbank.

Feldmann, H. (2004), "How flexible are labour markets in the EU accession countries Poland, Hungary and the Czech Republic?", *Comparative Economic Studies*, Vol. 46, No 2.

Hall, R. E. and C. Jones (1999), "Why do some countries produce so much more output per worker than others?", *Quarterly Journal of Economics*, Vol. 114, pp. 83-116.

Haltiwanger, J., S. Scarpetta and M. Vodopivec (2003), "How institutions affect labor market outcomes: evidence from transition countries", mimeo.

Heinz F. and M. Ward-Warmedinger (2006), "Cross-border labour mobility within an enlarged EU", ECB Occasional Paper No 52, October.

Huber P. and J. Köllö (2004), "Human capital, spatial mobility and lock in – the experience of the candidate countries", AccessLab/WIFO.

Huber P. (2003), "Inter-regional mobility in the accession countries: a comparison to EU-Member States", AccessLab/WIFO.

International Monetary Fund (2006), "Growth in the central and eastern European countries of the European Union – a regional review", Occasional Paper No 252.

Jones, C. I. (1995), "R&D-based models of economic growth", *Journal of Political Economy*, Vol. 103, pp. 759-84.

Jorgenson, D. W. (1963), "Capital theory and investment behaviour", *American Economic Review*, Vol. 53.

Katay, G. and Z. Wolf (2004), "Investment behaviour, user cost and monetary policy transmission – the case of Hungary", MNB Working Paper, 2004/12.

Kaufmann, D., A. Kraay and P. Zoido-Lobatón (2000), "Governance matters: from measurement to action", Finance Development, IMF, Vol. 37 No 2.

Kertesi G. and J. Köllö (2004), "Minimum wage and employment – Hungary's experiment", AccessLab/WIFO.

Lamo, A., J. Messina and E. Wasmer (2006), "Are specific skills an obstacle to labour market adjustment? Theory and an application to the EU enlargement", ECB Working Paper No 585, February.

Layard, R., S. Nickell and R. Jackman (1991), *Unemployment*, Oxford University Press.

Lenain, P. and L. Rawdanowicz (2004), "Enhancing income convergence in central Europe after EU accession," OECD Economics Department Working Paper No 392, June.

Levine, R. (1997), "Financial development and economic growth: views and agenda", *Journal of Economic Literature*, Vol. 35, pp. 688-726.

Levine, R. and D. Renelt (1992), "A sensitivity analysis of cross-country growth regressions", *American Economic Review*, Vol. 82 No 4, pp. 943-963.

Lim E.-G. (2001), "Determinants of, and the relationship between foreign direct investment and growth: a summary of the recent literature", IMF Working Paper No 175.

Mankiw, N. G. (1995), "The growth of nations", *Brookings papers on economic activity* 25, pp. 275-310.

Mankiw, N. G., D. Romer and D. N. Weil (1992), "A contribution to the empirics of economic growth", *Quarterly Journal of Economics* Vol. 107 No 2, pp. 407-437.

Mauro, P. (1995), "Corruption and growth", *Quarterly Journal of Economics*, Vol. 110 No 3, pp. 681-712.

Mulligan, C. B. and X. Sala-i-Martin (1993), "Transitional dynamics in two-sector models of endogenous growth", *Quarterly Journal of Economics* Vol. 108 No 3, pp. 739-773.

Nesporova, A. (2002) "Why unemployment remains so high in central and eastern Europe", ILO.

Nicoletti S., S. Golub, D. Hajkova, D. Mirza and K.-Y. Yoo (2003), "The influence of policies on trade and foreign direct investments", OECD Economic Studies No 36.

Nicoletti, G. and S. Scarpetta (2003), "Regulation, productivity and growth: OECD evidence", *Economic Policy*, April, pp.11-72.

North, D. C. (1990), *Institutions, institutional change and economic performance*, Cambridge University Press, New York, New York.

OECD (1997), Economic Survey of Slovenia.

OECD (1999), Employment Outlook.

OECD (2000a), Economic Survey of the Baltic States.

OECD (2000b), Employment Outlook.

OECD (2002a), Economic Survey of Hungary.

OECD (2002b), Economic Survey of Poland.

OECD (2002c), Economic Survey of the Czech Republic.

OECD (2002d), Economic Survey of the Slovak Republic.

OECD (2002e), "Foreign direct investment for development: maximising benefits, minimising costs".

OECD (2003), World Economic Outlook.

OECD (2004), "Enhancing economic convergence in Central Europe after EU accession", OECD Economic Outlook No 75.

OECD (2005) Science, Technology and Industry Scoreboard 2005.

OECD (2006), Education at a Glance.

Pagano, M. (1993), "Financial markets and growth", *European Economic Review*, Vol. 37, pp. 613-622.

Piatkowski, M. (2003), "The contribution of ICT investment to economic growth and labor productivity in Poland 1995-2000", Tiger Working Paper Series.

Pissarides, C. A. (1990), *Equilibrium unemployment theory*, Basil Blackwell, Oxford.

Prescott, E. C. (2004), "Why do Americans work so much more than Europeans", *Federal Reserve Bank of Minneapolis Quarterly Review*, Vol. 28, pp. 2-13.

Pula, G. (2003) "Capital stock estimation in Hungary: a brief description of methodology and results," MNB Working Paper, 2003/7.

Rashid, M. and J. Rutkowski (2001), "Labor markets in transition economies: recent developments and future challenges", Social Protection Discussion Paper No 111, World Bank.

Riboud, M., C. Sanchez-Paramo and C. Silva-Jauregui, (2002), "Does eurosclerosis matter? Institutional reform and labor market performance in central and eastern European countries", in Funck, B. and L. Pizzati (eds.), *Labor, Employment, and Social Policies in the EU Enlargement Process*, World Bank.

Rodrik, D., A. Subramanian and F. Trebbi (2004), "Institutions rule: the primacy of institutions over geography and integration in economic development," *Journal of Economic and Growth*, Vol. 9, pp. 131-165.

Rogoff, K. (1996), "The purchasing power parity puzzle", *Journal of Economic Literature*, Vol. 34, pp. 647-668.

Romer, P. M. (1986), "Increasing returns and long-run growth", *Journal of Political Economy*, Vol. 94 No 5, pp. 1002-1037.

Rutkowski, J. (2003), "Rapid labor reallocation with a stagnant unemployment pool: the puzzle of the labor market in Lithuania", World Bank Policy Research Working Paper No 2946, January.

Sachs, J. D. and A. M. Warner (1995), "Economic reform and the process of global integration", *Brookings Papers on Economic Activity*, Vol. 1, pp. 1-95

Saint-Paul, G. (1991), "Unemployment and productivity growth in OECD countries", mimeo.

Segerstrom, P. S., T. Anant and E. Dinopoulos (1990), "A Schumpeterian model of the product life cycle", *American Economic Review*, Vol. 80, pp. 1077-92.

Solow, R. (1956), "A contribution to the theory of economic growth", *Quarterly Journal of Economics*, Vol. 70 No 1, pp. 65-94.

Stapel, S. (2004), "Challenging the 'snapshot theory' of Purchasing Power Parities: Eurostat's revision of the PPP 1995 to 2000", Eurostat.

Swan, T. W. (1956), "Economic growth and capital accumulation", *Economic Record*, 32, pp. 334-361.

Tondl, G. and G. Vuksic (2003), "What makes regions in Eastern Europe catching up? The role of foreign investment, human resources and geography", ZEI Working Paper B12.

Tonin, M. (2005), "Updated employment protection legislation indicators for central and eastern European countries", Institute for International Economic Studies, Stockholm University, mimeo.

Török, A. (2005), "Measuring R&D expenditure" Development and Finance, *Quarterly Hungarian Economic Review*, 2005/3.

Vidovic, H. (2002), "Labor market trends in central and eastern European countries", in Funck, B. and L. Pizzati (eds.), *Labor, Employment, and Social Policies in the EU Enlargement Process*, World Bank.

Vodopivec, M. (2000), "Worker reallocation during Estonia's transition to market: how efficient and how equitable?", Social Protection Discussion Paper, No 18, World Bank.

WIFO (2004), "Foreign direct investment in central and eastern Europe with special attention to Austrian FDI activities in this region", July.

World Bank (2001), "Poland's labor market. The challenge of job creation".

World Bank (2002), "Slovak Republic: living standards, employment, and labor market study".

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