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Hungary, Slovakia and the Czech Republic: Longer-Term Growth Prospects

Leon Podkaminer and Robert Stehrer

The Vienna Institute for International Economic Studies[1]

1. Introduction

In 1937, Austria was not radically different, in terms of affluence, from either Hungary or Czechoslovakia. According to Maddison (1995) in that year the per capita (PPP) GDP in Hungary was at 80% of the Austrian level. The Czechoslovak GDP level was even higher, 90.7% of the Austrian. Bearing in mind that the Czech part of Czechoslovakia was much more developed than the Slovak part, Austria must have been actually poorer than the Czech lands in 1937. By 1995 the relative GDP positions had changed fundamentally. The Czech per capita GDP stood at 51% of the Austrian level, the Hungarian at 38% and the Slovak at 34.5% (Podkaminer and Hunya, 2005). Since then, however, the GDP gaps have been narrowing. By 2004 they stood at 57.7%, 50.3% and 43.0% respectively. Over the years 1995–2004 growth in the Czech Republic was faster than in Austria by an (implied) factor of 1.0138 (or by approximately 1.38 percentage points) per year. In Slovakia that factor equalled 1.0247 (or about 2.47 percentage points annually) and in Hungary 1.0316 (or 3.16 percentage points annually) respectively.

According to Maddison's recent (2002) judgement on the world's longer-term growth prospects, the per capita GDP in Western Europe will be rising by about 1.2% annually until 2015, while the per capita GDP in Eastern Europe (excluding the former USSR) will be rising by about 3%. The implied growth rate differential is about 1.78 percentage points annually. A mechanical application of these growth rates to the current (2004) per capita GDP levels of the countries considered suggests that by 2015, the Czech Republic will attain about 70% of the (then) Austrian level, Hungary 61% and Slovakia 52%.

The hypothesis of an approximately 1.8% growth differential (Eastern vs. Western Europe) is actually close to the assumption of a 2% growth differential which the wiiw has long been using in its 'catch-up' computations (see e.g.

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Podkaminer and Hunya, 2005). Of course, differentials of that order are not carved in stone. Various studies suggest different values for the future growth rates for the new EU Member States. Nonetheless, this work will provide some additional material suggesting that the three East European neighbours of Austria will continue their catching-up process at fairly moderate speeds.

2. The 'New Growth Theory' Approach

The prevailing approach to an assessment of longer-term growth prospects of emerging (i.e. 'less developed') economies is consistent with the 'new growth theory' (NGT; see, e.g., Barro and Sala-i-Martin, 1995). Unlike the traditional neoclassical growth accounting, the NGT allows for a number of 'soft' factors (e.g. pertaining to various institutional characteristics, quality of human capital etc.[2]) believed to be ultimate determinants of long-run economic growth. The rise of the NGT has probably much to do with the practical difficulties with the traditional neoclassical growth accounting (à la Robert Solow). The empirical estimates of the 'Solow residuals' do not show any regular trends over time, or space. Thus, even with reasonable assumptions concerning the trajectories of 'material inputs' (labour and capital) it is eventually rather difficult to be specific about the resulting growth paths. A way out is to relate the total factor productivity estimates to various 'institutional factors' – i.e. just the ones taken seriously in the NGT (see, e.g., Senhadji, 2000)[3].

Of course, there has been no 'pure' NGT: there is no theoretical model mathematically linking growth rates to a specific set of well-defined, measurable parameters. In practice the NGT researchers are free to define the variables and relationships they believe to be important. This stage of modelling is then followed

[2] Sometimes the growth theorists suggest to include even cultural factors, such as the population's religious beliefs (see Sala-i-Martin, 1997). More traditionally-minded NG theorists usually do not go that far (see Sachs and Warner, 1997).

[3] The traditional neoclassical growth theory, as well as its NGT versions, are rejected by a significant fraction of economists following the neo-Ricardian and/or post-Keynesian traditions (see, e.g., Pasinetti, 2000). They do not accept the idea of a macroeconomic production function. In a study by a leading 'structuralist' (Taylor and Rada, 2003) there is no place for the concept of total factor productivity. Instead, separate trends in labour and capital productivities are extrapolated from the past trends (with labour productivity being affected by the years of education, representing human capital formation). As far as Eastern Europe is concerned, the outcomes of the 'structuralist' model are generally consistent with those of most of the NGT approaches. In the long run (until 2030) the calculated per capita GDP growth rate in Eastern Europe is 3.2% per annum, against 1.8% assumed for the rich OECD countries. Maddison (2002) also suggests a 1.8% growth rate for the rich OECD countries, but with Western Europe's per capita GDP rising less, by 1.2%. In effect, Taylor and Rada's calculations support the conventional assumption of a 2 percentage points growth differential (Eastern vs. Western Europe).

by extensive econometric estimation and testing, usually with large cross-country time series sets of observations. It goes without saying that the eventual findings proposed by various researchers do differ, sometimes quite substantially (e.g. as far as the importance of particular factors is concerned). There is no consensus yet on the 'best' NGT model. Despite this, the models following the NGT appear to be preferred to more 'mechanical', hard-core, longer-term macro forecasting models for East European countries also for quite practical reasons. As documented by many authors (e.g. Berg et al., 1999, Campos and Coricelli, 2002, Fisher and Sahay, 2000, Havrylyshyn et al., 1998), the growth (actually decline) over the early transition years, and the ensuing recoveries in the mid-1990s, were dominated by radical institutional changes, abrupt alterations in the macroeconomic environment etc. The factors 'explaining' macro performance over much of the 1990s will not be playing any role in the future. By the same token the basic statistical data on the behaviour of the economies in question during the 1990s are at best of problematic value in specifying the behavioural equations which could be supposed to describe these economies' future performance.

3. Early Attempts at Assessing the Longer-Term Growth Rates

From the large number of empirical NGT studies available already at the beginning of the 1990s, two concrete specifications have gained wider popularity: Barro's (1991) and Levine-Renelt's (1992). The Barro growth equation is as follows:

$$\text{p.c. GDP growth rate} = 0.302 - 0.0075Y + 0.025PRIM + 0.0305SEC - 0.119GOV$$

where Y° is the log of p.c. GDP in 1960 (at PPP); PRIM is the primary school enrolment rate; SEC is the secondary school enrolment rate; and GOV is the share of government consumption expenditure in GDP. The Levine-Renelt growth equation is as follows:

$$\text{p.c. GDP growth rate} = -0.83 - 0.35Y - 0.38POP + 3.17SEC + 17.5INV$$

where Y is p.c. GDP in 1960 divided by 1000 (at PPP); POP is the growth rate of population; and INV is the share of gross fixed investment in GDP.

Both growth equations were re-specified with the data for the European transition economies for the year 1995 and then used for calculating the longer-run growth rates (see Fischer et al., 1998). Table 1 reports the outcomes of these calculations, as well as of some hypothetical alternative scenarios.

Table 1: Per Capita GDP Growth Rates for the Czech Republic, Hungary and Slovakia Obtained from Barro and Levine-Renelt Equations

	Barro		Levine–Renelt	
	GOV(1995)	**GOV=0.10**	**INV(1995)**	**INV=0.30**
Czech Republic	4.24	5.47	4.66	4.48
Hungary	5.15	5.15	3.51	4.47
Slovakia	4.66	5.85	3.63	4.98

Source: Fischer et al. (1998).

The first 'Barro' column in table 1 gives the growth rates calculated under the assumption that the government consumption share is kept at the level of 1995 (estimated by the IMF at 0.20 in the Czech Republic and Slovakia and at 0.10 in Hungary)[4]. The second 'Barro' column gives the growth rates under the assumption of government consumption being kept at 10% of the GDP. The first 'Levine-Renelt' column gives the growth rates calculated under the assumption that the share of gross fixed investment is kept at the level of 1995 (estimated by the IMF at 0.31, 0.23 and 0.22 respectively[5]). The last column in table 1 gives the growth rates calculated under the assumption that INV is kept at 30% of the GDP.

The more comprehensive models proposed by Barro and Sala-i-Martin (1995) 'explain' the per capita GDP growth rate by adding to Barro's (1991) list of explanatory variables some additional ones such as life expectancy at birth, UNDP's Human Development Index, share of government spending on education in GDP, share of investment in GDP, the Heritage Foundation's economic instability indicator etc.

A concrete version of the Barro–Sala-i-Martin model was specified with data for the European transition economies available in 1998 and then run under alternative scenarios for the consecutive decades 2000–2010, 2010–2020, 2020–2030 and 2030–2040. The full description of that version (NOBE, 2000) is available on the internet. The growth estimates for the Czech Republic, Hungary and Slovakia, derived under a base scenario[6] (with neither too pessimistic nor too optimistic assumptions) are collected in table 2.

[4] The actual GOV shares for 1995 are close to 0.20 in the Czech Republic and Slovakia (0.199 and 0.205 respectively), but vastly different from 0.10 in Hungary (0.24). The proper 'Barro GOV(1995)' estimate for Hungary is 3.5% instead of the 5.15% projected.

[5] The actual INV shares for 1995 are 0.32, 0.19 and 0.25 respectively (see *wiiw Handbook of Statistics*). The proper 'Levine-Renelt' growth rates under the INV(1995) scenario are 4.85%, 2.81% and 4.16% respectively.

[6] The base scenario assumes, somewhat optimistically, that the investment shares will be converging (from the levels observed in 1997) to 30% in 2010 and then will be continually declining to 20% by the year 2040.

Table 2: Per Capita GDP Growth Rates Derived from a Barro–Sala-i-Martin Model, Base Scenario

	2000–2010	2010–2020	2020–2030	2030–2040
Czech Republic	4.0	4.7	3.7	2.9
Hungary	5.5	5.0	4.0	3.2
Slovakia	5.1	4.6	3.6	2.9

Source: NOBE (2000).

The average growth rates for the 2000–2020 period implied by table 2 are 4.3% for the Czech Republic, 5.2% for Hungary and 4.8% for Slovakia. These numbers happen to be similar to the estimates reported in table 1 (the 'Barro GOV(1995)' column). However, the estimates for the current decade (2000–2010) reported in table 2 do not look very realistic because so far (for the period 2000–2004) the actual growth rates appear significantly lower in the Czech Republic (2.9%) and in Hungary (3.6%). Only in Slovakia the observed growth rate (4.6%) appears to be close to the projected one.

A particular assumption behind the growth rates from table 2 is about the share of gross fixed investment reaching a peak of 30% in 2010. However, investment shares have so far not followed upward trends in the 2000s. On average the investment share is about 27.3% in the Czech Republic, 22.6% in Hungary and 24.6% in Slovakia – with very little variation over time. For that reason it makes sense to consider the outcomes of a 'low scenario' assuming the investment share to rise to 30% of the GDP only by the year 2020. (The 'low scenario' is also less optimistic on enrolment rates, life expectancy and political stability.) The outcomes of the 'low scenario' are found in table 3. As can be seen, the projected growth rates for 2000–2010 are much closer to the rates actually observed in recent years. This suggests that in the longer run (i.e. until about 2020) per capita GDP in the Czech Republic will be rising by 3.7–4.2%, in Hungary by 4.7–4.3%, and in Slovakia by 4.7–4.1%.

Table 3: Per Capita Growth Rates Derived from a Barro–Sala-i-Martin Model, 'Low' Scenario

	2000–2010	2010–2020	2020–2030	2030–2040
Czech Republic	3.7	4.2	3.3	2.5
Hungary	4.7	4.3	3.5	2.8
Slovakia	4.7	4.1	3.2	2.5

Source: NOBE (2000).

4. Recent Attempts at Assessing the Longer-Term Growth Rates

4.1 The Wagner-Hlouskova Study

The parameters of equations underlying the growth rate projections tend to be derived econometrically from large heterogeneous panels, with data on the past performance of many countries largely unrelated to Central and Eastern Europe (and to Europe generally). In a recent study by Wagner and Hlouskova (2005) the estimation is based on data for the 14 'old' EU Member States (excluding Luxembourg). The entire sample period 1960–2001 is divided into four ten-year sub-periods. With the overall set of 56 observations they estimate 18 versions of the growth rate equation. The dependent variable is the growth rate of per capita GDP. All versions include the log of the initial GDP level (at PPP), the average share of government consumption in GDP, and the average share of fixed investment among its explanatory variables. The specific versions differ by the additional explanatory variables included: primary school enrolment rate, ratio of foreign trade to GDP, share of exports in GDP, population growth rate. Besides, three dummies are included in some versions of the basic equation: (1) for the first decade 1960–1969; (2) for Ireland; (3) for Germany in the last decade (1990–2001). The adjusted R-squared for the versions of the equation range between 0.470 and 0.639 with only one version displaying a low 0.293 adjusted R-squared value.[7] Generally, the estimates of the constant term are the most significant (and large) items – with other parameter estimates consistent (at least as far as their signs are concerned) with the common 'theoretical' beliefs. Thus government consumption appears to be 'bad' for growth, while investment and education are 'good'. Interestingly, the parameter for the German dummy, included in two versions, turns out to be significant, but very small and – unexpectedly – positive. Being Germany in the last decade meant having 0.3 percentage points higher growth than explained by all other factors then at work. Being Ireland meant having growth higher by 1.2–1.5 percentage points in all periods. The parameter for the dummy for the first decade is highly significant and fairly high – which is not surprising as the 1960s were the last decade of the post-war 'golden age' of capitalism. In the first decade growth, as 'explained' by the model, would have been higher by 1.1–1.3 percentage points than in the remaining decades, with all other factors being equal.

[7] The properties of the residuals of the individual versions of the growth equation are not discussed in Wagner and Hlouskova. On the other hand the average (over all 18 versions, and individual countries) errors seem quite low. The highest average error calculated for the whole EU-14 is 0.3 percentage points (against an actual growth rate of 1.96%) in the second period. For the remaining three periods the average errors are much lower.

Wagner and Hlouskova consider seven specific scenarios for the East European countries. The scenarios differ by the magnitudes of the shares of gross fixed investment and of government consumption in the GDP. Overall, the investment shares assumed are quite high, as compared to the actual values observed in the early 2000s in Hungary. Their average (over the scenarios considered) is 26.1% – by far more than the recently recorded average of 22.9%. The government consumption shares considered are rather too low, for all three countries. The averages (over the scenarios) of the government consumption shares are 13.9% in the Czech Republic and Slovakia, and 12.6% in Hungary. Each of the 18 versions of the growth equation, specified with data for individual East European countries, is then run for each of the seven scenarios considered. In effect one obtains 126 growth rate projections for each country. For the three countries under consideration here, the distributions of those projections are given in table 4.

Table 4: Characteristics of the Distributions of the Growth Rates Projected (in %)

	Mean	Std. Deviation	10%	90%
Czech Republic	3.32	0.44	2.62	3.76
Hungary	3.29	0.40	2.68	3.75
Slovakia	3.33	0.42	2.73	3.83

Note: The 10% and 90% columns contain the first and ninth decile of the distribution of the projected growth rates.

Source: Wagner and Hlouskova (2005).

As can be seen, the Wagner-Hlouskova results paint a much less optimistic picture than the earlier studies. Moreover, if one revised the unreasonably low levels of government consumption underlying the scenarios considered, one would end up with even lower values for the means and deciles than the ones reported in table 4. If the average shares of government consumption in GDP are at a realistic 20%, then the means and deciles for all three countries will be lower by some 0.5 percentage points. Thus the average expected growth rates for all three countries would be about 2.8%. As the mean growth rate for the EU-14 derived similarly as the means reported in table 4 is about 2.14%, the growth differential would be small, about 0.6 percentage points per annum. Under such conditions the catch-up process would be very long indeed – a matter of hundreds of years.

4.2 The NOBE II Study

The Wagner-Hlouskova study (and the earlier studies referred to above) do not allow, at least explicitly, for the so-called beta-convergence (i.e. the convergence in income levels due to alleged advantages the poorer countries have on account of availability of capital and/or advanced technologies supplied by highly developed

countries). The fact that the Wagner-Hlouskova study is concerned with growth equations estimated with data for a fairly homogeneous set of (predominantly highly developed) countries may explain why the resultant growth rate estimates for the new EU Member States are so low. The specific Wagner-Hlouskova equations are in fact incapable of capturing, even indirectly, the beta-convergence because there was very little scope for any significant beta-convergence in the EU-14 over the period 1960–2001. (True, the cohesion countries have been catching up with the remaining 11 countries, but within the latter homogeneous group convergence has been insignificant.)

It is generally assumed that beta-convergence actually takes place under suitably stable political and economic conditions. Under such conditions the parameter β, measuring the speed of convergence, is assessed (or assumed) to be about –2% (meaning that the per capita PPP GDP gap between the leading and the backward areas shrinks by about 2% per annum, at least in the longer run). Of course, it is essential to relate β to some relevant indicators empirically. The NOBE (2002) study (NOBE II henceforth) worked with 112 observed β (vs. the EU-15) for 26 countries (from Europe as well as the Americas, Africa and Asia) over four consecutive decades (1960s, 1970s, 1980s and 1990s); β was regressed on five variables (and eight dummies for some country/decade observations). The results of the regression analysis are shown in table 5.

Table 5: Speed of Convergence (β) 'Explained': Regression Results

Variable	Coefficient	Standard error	t-Statistics	p-value
Constant	1.334	0.38	3.50	0.00
Political stability index	–0.173	0.08	–2.08	0.04
Public spending on education (% GDP)	–0.133	0.06	–2.05	0.04
Change in relative telephone density	–0.057	0.01	–6.24	0.00
Gross domestic savings (% GDP)	–0.030	0.01	–2.70	0.01
Inflation rate	0.010	0.00	6.45	0.00

Note: The relative telephone density is the per capita number of fixed telephone lines relative to the average for the OECD countries.

Source: NOBE (2002).

As can be seen, all coefficients have 'correct' signs, and are all highly significant. (The political stability index ranges between 0 and 6; 0 stands for protracted wars, revolutions, collapse of the state, 6 stands for complete political stability, EU membership.) The overall fit is quite good (the adjusted R–squared is 0.792). Moreover, the explanatory variables are only weakly correlated (thus co-linearity is not a problem).

The equation for β can be used for assessing the future growth rates in the new EU Member States. More specifically, first one has to set some plausible scenarios on the future developments of factors determining the β parameters for the Czech

Republic, Hungary and Slovakia. The NOBE II study considers three scenarios ('low', 'base', and 'high'). The 'low' scenario assumes a political stability index equal to 5 for the years 2000-2010 (similarly as in 1995–2000) and equal to 5.5 for the years 2010–2020, in all three countries. In the remaining two scenarios the political stability index is assumed to equal 5.5 over the years 2000–2010 and 6 later on, in all three countries. In the 'low' scenario inflation is assumed to be 5% per annum in the first decade and 4% in the second. In the remaining scenarios inflation equals 4% in the first decade, followed by 2% in the second. The remaining characteristics of the scenarios considered are contained in table 6. The numerical values for the β parameters for the three scenarios are found in table 7.

Table 6: Characteristics of the NOBE II Scenarios

		actual	low		base		high	
		1995–00	**2000–10**	**2010–20**	**2000–10**	**2010–20**	**2000–10**	**2010–20**
Public spending on education	CZ	5.4	5.2	5.6	5.7	6.3	6.2	7.1
	HU	5.3	5.1	5.6	5.6	6.3	6.1	7.1
	SK	5.0	5.0	5.5	5.3	6.3	6.0	7.0
Relative telephone density	CZ	63.2	66.9	72.5	70.5	79.4	72.4	83.4
	HU	63.2	66.9	72.5	70.5	79.4	72.4	83.4
	SK	52.3	57.0	65.6	61.8	73.3	74.2	78.5
Gross domestic savings	CZ	28.1	26.6	25.8	29.1	29.5	30.6	31.8
	HU	28.2	26.6	25.8	29.1	29.5	30.6	31.8
	SK	25.2	25.1	25.0	27.6	28.8	29.1	31.0

Source: NOBE (2002).

Table 7: β Parameters (%) for the Three Scenarios

	low		base		high	
	2000–10	**2010–20**	**2000–10**	**2010–20**	**2000–10**	**2010–20**
Czech Republic	–1.2	–1.7	–2.0	–2.5	–2.6	–3.2
Hungary	–1.2	–1.7	–2.0	–2.5	–2.6	–3.2
Slovakia	–1.2	–1.7	–2.1	–2.6	–2.7	–3.4

Source: NOBE (2002).

The specific β parameters allow the computation of growth rates of per capita GDP. However, this requires additional assumptions on the per capita GDP growth rates in the EU-15. The NOBE II study models, quite extensively, the long-term growth for the EU-15 (and other highly developed OECD) countries. For our current purposes it is sufficient to know that the NOBE II study ends up with three scenarios of growth in the EU-15: 'base', 'low', and 'high'. The 'base' scenario stipulates 2.4% annual per capita GDP growth over 2000–2010, followed by 2.3% over 2010–2020. The 'high' scenario stipulates a 2.7% growth rate in either decade, while the 'low' scenario stipulates a 2% growth rate in the first decade,

followed by a 1.7% rate in the second.[8] The results of the NOBE II study for our three countries are reported in tables 8 and 9.

Table 8: Per Capita GDP Growth Rates (%) in the NOBE II Study

	low		base		high	
	2000–10	**2010–20**	**2000–10**	**2010–20**	**2000–10**	**2010–20**
Czech Republic	2.7	2.5	3.6	3.3	4.2	3.9
Hungary	3.0	2.8	4.0	3.7	4.7	4.2
Slovakia	3.1	3.0	4.3	3.9	5.0	4.5
EU-15	2.0	1.7	2.4	2.3	2.7	2.7

Source: NOBE (2002).

Table 9: Per Capita GDP Levels Relative to the EU-15 (at Constant 1999 PPP)

			low	base		high		*actual*	
	2000	**2010**	**2020**	**2010**	**2020**	**2010**	**2020**	***2000***	***2004***
Czech Republic	60.0	64.4	69.9	67.4	74.7	69.4	77.9	*59.6*	*63.1*
Hungary	52.0	57.3	63.9	60.8	69.6	63.2	73.4	*48.2*	*52.4*
Slovakia	48.5	54.2	61.6	58.3	68.0	60.9	72.2	*42.0*	*47.4*
EU-15	100.0	100.0	100.0	100.0	100.0	100.0	100.0	*100.0*	*100.0*

Source: NOBE (2002) and authors' calculations (last two columns).

The first column of table 9 gives the initial values for the relative per capita GDP levels assumed in the NOBE II study for the year 2000. These values differ – in particular for Hungary and Slovakia – from the updated (actual) values for 2000, which are reported in the penultimate column of table 9. The last column of table 9 gives the most recent (2004) values of the relative per capita GDP levels in the three countries considered, expressed at constant 1999 PPP. (At current PPP the relative values in question were slightly different from the constant-PPP ones: in the Czech Republic they were at 58.5% in 2000 and 64.2% in 2004. The respective values for Hungary were 48.2% and 55.9%; for Slovakia 42.0% and 47.8%.)

As can be seen, the NOBE II study suggests growth rate differentials vs. the EU-15 distinctly higher than the Wagner-Hlouskova study. For the 2000–2010 decade the differentials range between about 0.7% and 1.5% for the Czech Republic, 1% and 2% for Hungary and 1.1% and 2.2% for Slovakia. For the 2010–2020 decade the differentials range between 0.8% and 1.2% for the Czech Republic, 1.1% and 1.4% for Hungary and 1.3% and 1.8% for Slovakia.

[8] The NOBE model for the highly developed OECD countries stipulates a per capita GDP growth rate in Austria ranging between 2.5% and 3.2% in the first decade and between 1.8% and 3% in the second decade.

5. Updating the NOBE II Calculations

5.1 Political Stability

The NOBE II model can be updated and run for the years 2005–2015. The most consequential revision is about the index of political stability. In all scenarios for 2005–2015 it is to be assumed that the political stability index equals 6 (and not 5.5 or even 5.0, as was assumed in some scenarios of the original NOBE II study). Besides, it makes sense to revise the numerical values for some other determinants of the β parameters, for instance, the inflation rate in the Czech Republic – which is highly unlikely to be 4% or 5% p.a. as was assumed in some scenarios of the original NOBE II study.

The three updated scenarios ('low', 'base' and 'high') for the decade 2005–2015 assume the shares of gross domestic savings in GDP to be the same as in the respective NOBE II scenarios for the years 2000–2010 (see table 6). The numerical values for public spending on education and for relative telephone density for the years 2005–2015 are assumed to be the averages of the respective values for the decades 2000–2010 and 2010–2020 (see table 6). Besides, the initial relative per capita GDP positions (for 2004) represent the current knowledge (and are taken from the last column of table 9).

The growth rates and relative per capita GDP positions allowing for the revisions just characterized are found in table 10.

Table 10: Per Capita GDP Growth Rates for the Years 2005–2015 and Relative per Capita GDP Positions at Constant 1999 PPP in 2015

	growth rates			relative positions			
						2015	
	low	**base**	**high**	**2004**	**low**	**base**	**high**
Czech Republic	2.8	3.6	4.1	63.1	68.7	71.3	73.2
Hungary	3.2	4.1	4.8	52.4	59.4	62.9	65.3
Slovakia	3.4	4.6	5.2	47.4	55.5	59.4	62.1
EU-15	2.0	2.4	2.7	100.0	100.0	100.0	100.0

Source: Authors' calculations.

As can be seen, the updates result in the growth rates for the years 2004–2015 being slightly higher than in the original NOBE II calculations for the years 2000–2010. Correspondingly, the growth rate differentials vs. the EU-15 appear to be somewhat higher. They range between 0.8% and 1.4% for the Czech Republic, 1.2% and 2% for Hungary, and 1.5% and 2.5% for Slovakia.

5.2 The Position versus Austria

At 1999 PPP the Czech per capita GDP was equal to 55.1% of the Austrian level, Hungary's to 46% and Slovakia's to 41.5% in 2004. Assuming future Austrian per capita GDP growth rates equal to those of the EU-15 (as in table 10) one can project the relative position vs. Austria of the three countries considered (see table 11).

Table 11: Per capita GDP in 1999 and 2004 and projections for 2015 (in EUR, at constant 1999 PPP)

			2015		
	1999	**2004**	**low**	**base**	**high**
Czech Republic	12139	14130	18586	20850	21984
Hungary	9707	11765	16637	18304	19704
Slovakia	8717	10643	15375	17555	18588
Austria	23445	25625	31881	33263	34351
		as % of the Austrian level			
Czech Republic	51.8	55.1	58.3	62.7	64.0
Hungary	41.4	46.0	52.2	56.0	57.4
Slovakia	37.2	41.5	48.3	52.8	54.1

Source: Authors' calculations.

Total GDP levels (allowing for the likely demographic changes) are reported in table 12.

Table 12: Total GDP at Constant 1999 PPP

				GDP (EUR billion)				
	Population (million)					2015		
	1999	**2004**	**2015**	**1999**	**2004**	**low**	**base**	**high**
Czech Republic	10.3	10.2	10.1	124.9	144.1	188	211	222
Hungary	10.1	10.1	9.8	97.7	118.8	163	179	193
Slovakia	5.4	5.4	5.4	47.1	57.5	83	95	100
Total	25.8	25.7	25.3	269.7	320.4	434	485	516
Austria	8.1	8.2	8.3	189.7	207	261	273	282

Note: The population projections for 2015 are taken from the UN forecast (UN, 2005).

Source: Authors' calculations.

As can be seen, the combined economic 'weights' of the three Austrian neighbours will be increasing relative to the Austrian economic 'weight'.

At constant PPP for more recent years, the position of the three countries vs. Austria is projected to be even more favourable. This is exemplified by table 13, with all relevant indicators expressed at constant 2004 PPP.

Table 13: Projected Positions vs. Austria at Constant 2004 PPP

			2015				2015	
	2004	**low**	**base**	**high**	**2004**	**low**	**base**	**high**
		per capita				**total (EUR billion)**		
Czech Republic	15647	21201	23088	24344	160	213	232	245
Hungary	13623	19264	21195	22816	138	189	208	224
Slovakia	11645	16822	19098	20338	63	91	103	110
Total					361	493	543	579
Austria	27104	33700	35183	36334	222	280	292	302
		as % of Austrian level						
Czech Republic	57.7	62.9	65.6	67.0				
Hungary	50.3	57.2	60.2	62.8				
Slovakia	43.0	49.9	54.3	56.0				

Source: Authors' calculations.

As can be seen, at constant 2004 PPP the three countries' positions vs. Austria are higher by 2–5 percentage points. These 'improvements', representing the effects of favourable changes in the structure of prices and quantities produced/consumed in the catching-up countries, must be expected to continue in the future as well. At current PPP of the year 2015 the positions of our three countries vs. Austria (and the whole EU-15) may well turn out to be higher than suggested by table 13 by several per cent. (The structural changes, in prices and quantities, improved the position of the Czech Republic vs. Austria by 4.7% over the years 1999–2004, with quantitative change adding 6.3%. For Hungary the respective components are 9.3% and 11.1%, for Slovakia 3.6% and 12%. It seems quite reasonable to expect the structural changes to produce effects of at least similar size over the period twice as long: 2004–2015.)

Also at current market prices and exchange rates the three countries have been catching up with Austria. This is yet another indication of the continuing structural change and price convergence. At current exchange rates the combined GDP of the three countries constituted about 60% of the Austrian GDP in 1999. By 2004, that ratio was 84%. By 2015 the combined GDP at current prices and exchange rates of the three countries will be significantly higher than the Austrian GDP. At the same time the relative per capita GDP at current prices/exchange rates will still be about twice as high in Austria than in the countries considered. (In 2004 the Austrian per

capita GDP at current prices/exchange rates was about three times the Hungarian and Czech levels and about four times the Slovak level.)

This conclusion can be substantiated with an analysis of the relationships between per capita GDP levels (at PPP) and the levels of the exchange rate deviation index (ERDI=ER/PPP). For Europe it turns out that there is a strong link between the two items, with the ERDI for the individual countries equalling roughly the relative per capita PPP GDP level vs. the EU-15.[9] The per capita PPP GDP in the three countries considered will be attaining about 70% of the EU level in 2015. Hence their ERDI will be about 0.7. Thus relative to the EU-15 their per capita GDP at the exchange rate will be about 50%.

5.3 Investment and Foreign Trade

The NOBE II model does not explicitly allow for capital formation (investment) and for foreign trade developments. Indirectly though, it allows for both: one of the explanatory variables determining the speed-of-convergence parameter (beta) is the share of gross domestic saving in the GDP. Of course, gross domestic saving is the sum of two items: gross capital formation and balance of trade in goods and non-factor services (the national accounts category). The major advantage in having the 'saving' variable instead of having separate 'investment' and 'trade' (exports, imports, trade balance) variables is that more often than not investment and foreign trade prove to be highly correlated. Investment expansion often tends to be associated with an acceleration of imports and deteriorating trade balances. (Also, imports and exports tend to be highly correlated.) The inclusion of separate variables for investment, exports, imports and trade balance is therefore quite risky econometrically. The estimates derived from observations that include data for strongly correlated explanatory variables are, apparently, highly significant, and the model's goodness-of-fit is seemingly superior. In actual fact the estimates derived from models with multicollinear explanatory variables are of little value.

The projected GDP levels for 2015 (see tables 11 and 12) have been derived on specific assumptions concerning the future shares of gross domestic savings in the GDP (see table 6). It is reasonable to expect that in the long run the shares of gross domestic savings will be converging to the shares of capital formation (and of gross fixed capital formation in particular). This regularity is simply explained: no country can indefinitely continue to be a net borrower (or lender). Nonetheless, for extended periods of time the trade imbalances (deficits or surpluses) can be

[9] The relationship ERDI = c*GDP (where GDP is the per capita PPP GDP relative to the EU-15) has been tested econometrically with the data provided by the ECP projects. The (population-weighted) cross-country equations for individual years yield highly significant results. (For instance, for 1996 c = 0.994, with t-Statistics = 47.8 and adj. Rsq. = 0.982. For 1999 c = 1.008, with t-Statistics = 43.3 and adj. R sq. = 0.977. For 2001 c = 1.011, t-Statistics = 39.2, adj.Rsq. = 0.971.)

significant. In the Central European transition countries (excepting Slovenia) the trade deficits have been rather high for quite some time. This applied also to the Czech Republic, Slovakia and Hungary. However, recently things have been changing. The ratios of trade deficits to gross domestic savings are on the decline. The 12-year average (covering the years 1993–2004) for these ratios were 9.4% in the Czech Republic, 13.6% in Hungary and 18.8% in Slovakia. The averages for the last four years equal 6.9%, 12.4% and 11.4% respectively. Apparently, trade balances are losing importance as components of gross national savings. Capital formation seems to have been gaining importance accordingly. This regularity is captured econometrically by the following regression:

$$I/S = C(1) + C(2)TB$$

where I is the share of gross capital formation in GDP, S is the share of gross domestic saving, TB is the share of the trade balance, and C(1) and C(2) are estimated parameters. The estimation, with yearly data for the period 1997–2004, delivered parameters significant at 1% levels. In all three cases the C(1) parameter is close to 1 (0.999; 0.993; 0.993), indicating 'closeness' of domestic savings and gross capital formation, while the parameter C(2) equals -0.039 for the Czech Republic, -0.045 for Hungary, and -0.044 for Slovakia.

Assuming that the relationship between I/S and TB remains valid over the next 11 years, one can calculate the ranges of the shares of gross capital formation and of trade balances corresponding to the projected GDP figures for 2015 (see table 14.

Table 14 suggests that in the future the character of growth in the three countries will be changing. Foreign trade will cease to be their Achilles' heel. This has already been evidenced by the recent performance of the Czech Republic. High capital formation will be increasingly financed domestically – the trade deficits will be quite low. Thus, the countries considered will become similar to Slovenia where relatively high levels of capital formation have been associated with roughly balanced trade in goods and services. The transformation of the three countries (from being chronically in deficit vs. the rest of the world) seems quite likely in the light of their recent trade developments. The volumes of their exports and imports have been rising at double-digit speed, and this despite the ongoing strong real appreciation of their currencies and apparent loss of external competitiveness (i.e. very fast rise in unit labour costs).

Table 14: Shares of Trade Balance, Gross Capital Formation and Gross Domestic Savings in 2004 and 2015

	2004	2015		
		low	base	high
Czech Republic				
Trade balance	–0.3	–0.7	–0.3	–0.2
Gross capital formation	27.6	27.3	29.4	30.8
Gross domestic savings	27.3	26.6	29.1	30.6
Hungary				
Trade balance	–3	–1	–0.7	–0.6
Gross capital formation	24.2	27.6	29.8	31.2
Gross domestic savings	21.2	26.6	29.1	30.6
Slovakia				
Trade balance	–2.7	–0.7	–0.4	–0.3
Gross capital formation	26.3	25.8	28	29.4
Gross domestic savings	23.7	25.1	27.6	29.1

Source: Authors' calculations.

5.4 Foreign Direct Investment

Hungary, the Czech Republic and Slovakia have been significant recipients of FDI. By the end of 2004 the stock of inward FDI was about EUR 42.2 billion in Hungary, 41.4 billion in the Czech Republic, and 11.0 billion in Slovakia.[10] By comparison, the FDI stock in Austria (as reported by Eurostat) was about EUR 41.2 billion in 2002. In that year, the combined FDI stocks of Hungary, Slovakia and the Czech Republic equalled EUR 79.7 billion, according to the Eurostat source. (The latest wiiw estimate for end-2004 is EUR 96.6 billion.) In relative terms FDI is very high in all three countries investigated. In 2004 the ratio of the FDI stock to GDP (at the exchange rate) equalled 0.48 in the Czech Republic, 0.55 in Hungary and 0.33 in Slovakia. By comparison, the ratio for the EU-13 (excluding Ireland and Luxembourg, the countries with atypically high FDI/GDP ratios) equalled 0.35 in 2002 (and stood at 0.19 in Austria). Even cohesion countries such as Spain and Portugal had much lower FDI stock-to-GDP ratios (0.31 both).

There are several reasons for the unusually high FDI levels in the three countries. First, at the beginning of transition (in the early 1990s) their economies were almost entirely state-owned. During the privatization process large chunks of national (state-owned) property were sold to foreign parties. Of course, no comparable process has ever taken place in the 'old' EU countries. Second, in the

[10] See *wiiw Database on Foreign Direct Investment in Central, East and Southeast Europe. Opportunities for Acquisition and Outsourcing*, wiiw, May 2005.

'old' EU countries the national policy often tries to restrict foreign ownership in some firms or sectors considered 'strategically' important (infrastructure, banking etc.). In the transition countries the tendency for keeping FDI away from 'vital' sectors is much weaker. In effect the whole national commercial banking systems in the three countries investigated are actually foreign-owned/controlled. Besides, FDI is strongly attracted to some sectors (such as retail/wholesale trade) which are much less regulated than in the 'old' EU.[11] Third, the high FDI/GDP ratios reflect high deviations between the exchange rates and the purchasing power parities. If GDP is expressed in purchasing power parities (thus measuring the 'real' volumes of goods and services produced nationally), then the ratios of the stocks of FDI to GDP appeared, at end-2004, to be quite moderate: 0.259 in the Czech Republic, 0.322 in Hungary and 0.175 in Slovakia. By comparison, the same ratio equalled, in 2002, 0.264 in Germany, 0.267 in Spain, 0.249 in France, 0.20 in Austria, and 0.234 in Portugal. (Overall, the same ratio for the EU-13 equalled 0.358 in 2002.)

The intensity of the FDI inflows to the three countries under investigation is unlikely to rise further in the future. The privatization process is nearing its natural end as the supply of state-owned assets is drying out. Of course, the relatively low levels of wages (i.e. low GDP levels) will still be attracting some FDI – similarly as lower corporate tax rates and/or more liberal labour codes and other regulations. But these factors will be of diminishing importance. The ongoing GDP convergence will be eroding the wage advantages, while some sorts of EU-wide tax/legal harmonization is likely to undermine the non-wage advantages. Besides, already now the three countries examined compete with Romania, Ukraine and Turkey (not to mention China) where wages are much lower and regulations imposed on business activities much more lax. Thus it is to be expected that FDI seeking low-wage cost locations will be increasingly preferring more distant destinations.

Given the above considerations, it may be assumed that the ratio of the stock of FDI to GDP will be approaching a kind of saturation level in all three countries. We assume that this terminal level is 0.35 – corresponding to the average level observed in the EU-13 recently. Under this assumption it is possible to calculate the terminal stocks of FDI in the future (more specifically by the year 2015), depending on the estimated levels of GDP in 2015. Because the FDI stock to GDP ratio can be calculated in two ways, depending on whether GDP is calculated at exchange rates or at purchasing power parities (in either case the ratio for the EU-13 was about 0.35 recently), one can have two sets of estimates for the FDI stocks. Table 15 reports the estimated stocks of inward FDI in the Czech Republic, Hungary and Slovakia by the year 2015. These estimates are based on the GDP

[11] By end-2003 manufacturing accounted for only 42% of the FDI stock in the Czech Republic. Financial intermediation accounted for 16.8%, trade for 12.3%. In Hungary the respective shares were 45.8%, 10% and 9.8%, in Slovakia 38.5%, 22.4% and 12%.

volumes derived from the updated NOBE II model (see, e.g., table 13). The upper part of table 15 gives the values of total GDP in 2004 and in 2015, at 2004 PPPs (left-hand part) and at 2004 prices/exchange rates (right-hand part).

Below the upper part, there are estimates of the terminal stocks of FDI (in 2004 euro, at exchange rates). On the left-hand side there are estimates of the terminal stocks corresponding to the assumption that the GDP in the FDI stocks-to-GDP ratio is measured in PPPs. The right-hand side converts the denominator in that ratio using the exchange rates.

Finally, the lower part of table 15 gives the average yearly FDI inflows implied by the estimated magnitudes of the terminal ratios of the FDI to GDP. As can be seen, the convergence of the FDI stock-to-GDP ratio to the terminal value of 0.35 has different implications, depending on the way GDP is measured. With the GDP expressed at the exchange rates (which seems to be the traditional convention), the future FDI inflows would be quite small (especially in Hungary and under the 'low' growth scenario). Things look much better with the terminal ratio's denominator expressed in PPPs. Here the attainment of the terminal 0.35 ratios implies quite high inflows, even under the 'low growth' scenario.

Table 15: Stocks of Inward FDI in 2015

	2004	2015			2004	2015		
		low	base	high		low	base	high
	GDP (billion 2004 PPP euro)				GDP (billion 2004 euro)			
CZ	160	213	232	245	86.2	145	164	177
HU	138	189	208	224	80.7	111	129	145
SK	63	91	103	110	33.1	50	61	68
Total	361	493	543	579	200.0	306	354	390
	FDI stock (billion 2004 euro)				FDI stock (billion 2004 euro)			
CZ	41.4	74.6	81.2	85.8	41.4	51.2	57.9	62.8
HU	44.2	66.2	72.8	78.4	44.2	39.3	45.8	51.2
SK	11.0	31.9	36.1	38.5	11.0	17.7	21.4	23.9
Total	96.6	172.6	190.1	202.7	96.6	108.2	125.1	137.9
		Average yearly FDI inflow 2004–2015 (billion 2004 euro)						
CZ		3.0	3.6	4.0		0.8	1.4	1.9
HU		2.0	2.6	3.1		–0.5	0.1	0.6
SK		1.9	2.3	2.5		0.6	0.9	1.1
Total		6.9	8.5	9.6		0.9	2.5	3.6

Source: Authors' calculations.

6. Productivity Growth and Employment

6.1 Changes in the Structure of Value Added and Employment

A similar approach as described above for convergence in total GDP per capita can be applied in order to assess the speed of convergence at a more detailed sectoral level. Stehrer (2005) estimated the β-convergence parameter for labour productivity (value added per employee) for a sample of OECD countries and seven sectors (see tables below).[12] Similarly, the speed of convergence in value added shares has been estimated. Together with information on the initial productivity gaps and deviations from EU-15 average sectoral value added shares, one can simulate likely future developments with respect to the development of sectoral shares of value added and employment. Based on the estimates of the convergence parameters, the values reported in table 16 have been used in the calculations of the scenarios. The exogenous growth rate was proxied by the long-term sectoral value added per capita of the larger country group. These are also reported in table 16. According to these estimates, convergence is fastest in industry and in the services sectors transport, business and public services with a half time of convergence at around 20 years. The speed of convergence in value added shares is generally lower; the half-time is low in industry and public services. Using a convergence framework where the speed of adjustment depends on the deviation from the reference countries (in this case the EU-15) and using the empirically estimated parameters allows to investigate scenarios of value added and employment shares by industry for the next few years. In Stehrer (2005) a framework introduced by Verspagen (1991) was adopted for this research at the disaggregated level.

Table 16: Parameter Values used in Scenarios

	Productivity convergence			Convergence in value added shares		
	Exogenous	β -Coefficient	Half-time	Exogenous	β -Coefficient	Half-time
Agriculture	0.046	–0.020	35	–0.007	–0.012	58
Industry	0.034	–0.030	23	0.002	–0.039	18
Construction	0.011	–0.010	69	0.002	–0.011	63
Trade, repairs, hotels	0.015	–0.020	35	–0.001	–0.023	30
Transport	0.041	–0.035	20	–0.002	–0.023	30
Business services	0.000	–0.040	17	0.000	–0.016	43
Public services	0.019	–0.035	20	0.001	–0.039	18

Source: Authors' calculations.

Before presenting the most important results of the scenarios we show that there is a large potential for catching-up by industry despite the fact that these countries

[12] See also Bernard and Jones (1996) where estimates of convergence are provided for different sectors.

have already experienced rapid convergence to the EU-15 in terms of labour productivity, value added and employment structures since the beginning of transition (see tables 17[13], 16 and 17). Despite the progress attained so far these gaps are still sizeable and further dynamic convergence can be expected in the coming years.

Table 17: Productivity Levels in % of EU-15, 2002

	Agriculture[1)]	Industry	Construction	Trade, repairs and hotels	Transport	Business services	Public services	Total
Czech Republic	105.0	49.5	29.4	83.9	59.6	81.3	38.0	58.9
Hungary	78.0	49.9	57.4	52.6	49.5	79.7	59.0	57.9
Slovakia	76.6	40.8	33.7	73.8	58.1	90.2	62.6	57.4

Note: [1)] EU without Austria.

Source: Authors' calculations.

Table 18: Value Added Shares, 2002

	Agriculture	Industry	Construction	Trade, repairs and hotels	Transport	Business services	Public services	Total
Czech Republic	5.6	33.5	3.4	17.9	11.1	18.0	10.4	100
Hungary	5.5	30.3	5.4	12.3	9.7	18.7	18.1	100
Slovakia	5.4	27.8	3.7	15.6	10.4	18.0	19.1	100
EU-15	2.8	22.1	5.5	15.4	8.8	25.1	20.5	100

Source: Authors' calculations.

Table 19: Employment Shares, 2002

	Agriculture	Industry	Construction	Trade, repairs and hotels	Transport	Business services	Public services	Total
Czech Republic	4.8	30.7	8.9	16.6	7.7	7.7	23.6	100
Hungary	6.2	27.1	7.0	17.8	8.0	8.0	25.9	100
Slovakia	6.2	30.1	8.3	16.0	7.3	6.7	25.5	100
EU-15	5.3	16.9	7.1	19.5	6.2	15.1	30	100

Source: Authors' calculations.

With respect to sectoral productivity levels, the three countries are below the EU-15 averages in almost all sectors; the only exception is the agricultural sector of the Czech Republic, which may be explained by the large-scale production units in this country. The gaps are largest in industry and construction as well as transport, whereas they are smaller in agriculture, trade, repairs and hotels and business services. In terms of value added shares, the countries are above the EU-15 average

[13] Note that this table reports value added per employee in 1995 prices. Thus the figures – also for the total – differ from the ones reported above.

in particular in agriculture and industry and below the average in business and public services as well as transport. These two components are reflected by definition in the employment shares which are reported in table 19. The employment shares are again above the EU-15 average in agriculture and industry and quite below that average particularly in business services and less so in public services. Further, they are also lower in trade, repairs and hotels. For a detailed description of changes in employment structures see Landesmann, Vidovic and Ward (2004).

Using this information on the speed of convergence and the initial deviations from EU-15 means that one may calculate future changes of labour productivity and output structures under the assumption that these countries converge to the EU-15 over time. These two variables then also determine the structure of employment. In order to calculate the level of employment, a further assumption on total GDP growth is required. We summarize the most important findings of these calculations. For the methodology applied and more detailed results see Stehrer (2005).[14] Table 20 summarizes the projections with respect to value added shares, productivity levels compared to the EU-15 and employment shares.

The model shows a relatively slow adjustment with respect to value added shares which depends on the speed of convergence and the initial deviation from EU-15 shares. The most pronounced effects can be observed in industry, where the share declines by about 4 percentage points in the Czech Republic and by 2.5 percentage points in Hungary. Further, there is an increase in the share of the business and public services sectors. These are also those sectors that are characterized by the highest speed of convergence in value added shares and – in some cases – relatively large deviations from EU-15 shares in the initial period. Productivity is more dynamic as initial gaps are larger in most cases and the speed of convergence is higher in important sectors: agriculture, industry and the services sectors. In the Czech Republic the most important productivity increases occur in industry, transport and public services. For the other two countries (Hungary and the Slovak Republic) the growth rate of productivity is lower as the initial productivity level is closer to the EU-15.

[14] There are slight differences with respect to the numbers reported therein, as here we have used revised data.

Table 20: Results from Scenarios

Czech Republic

	Value added shares (in %)				Productivity (in % of EU-15)				Employment shares (in %)			
	2002	**2007**	**2012**	**2015**	**2002**	**2007**	**2012**	**2015**	**2002**	**2007**	**2012**	**2015**
Agriculture	5.6	5.3	5.0	4.8	105.0	104.5	104.0	103.8	4.8	4.3	3.8	3.5
Industry	33.5	31.8	30.4	29.6	49.5	54.6	59.4	62.1	30.7	26.6	23.2	21.3
Construction	3.4	3.6	3.8	3.9	29.4	31.2	33.0	34.1	8.9	10.0	11.0	11.5
Trade, Repair, Hotels	17.9	17.8	17.6	17.5	83.9	85.4	86.7	87.4	16.6	18.0	19.1	19.6
Transport	11.1	10.8	10.5	10.4	59.6	64.8	69.5	72.0	7.7	6.8	5.9	5.4
Business Services	18.0	18.7	19.4	19.7	81.3	84.4	87.1	88.4	7.7	9.2	10.8	11.8
Public Services	10.4	12.0	13.4	14.1	38.0	44.4	50.6	54.1	23.6	25.2	26.3	26.8

Hungary

	Value added shares (in %)				Productivity (in % of EU-15)				Employment shares (in %)			
	2002	**2007**	**2012**	**2015**	**2002**	**2007**	**2012**	**2015**	**2002**	**2007**	**2012**	**2015**
Agriculture	5.5	5.2	4.9	4.7	78.0	79.8	81.6	82.5	6.2	5.5	4.7	4.3
Industry	30.3	29.1	28.2	27.7	49.9	55.0	59.7	62.4	27.1	24.0	21.3	19.8
Construction	5.4	5.5	5.6	5.6	57.4	59.0	60.6	61.5	7.0	7.9	8.8	9.3
Trade, Repair and Hotels	12.3	12.7	13.0	13.1	52.6	56.0	59.1	61.0	17.8	19.3	20.4	21.0
Transport	9.7	9.6	9.4	9.3	49.5	55.4	60.9	64.0	8.0	6.9	5.9	5.4
Business Services	18.7	19.3	19.8	20.1	79.7	83.0	85.9	87.4	8.0	9.5	11.2	12.2
Public Services	18.1	18.8	19.3	19.5	59.0	64.2	69.0	71.6	25.9	27.0	27.7	28.0

Slovak Republic

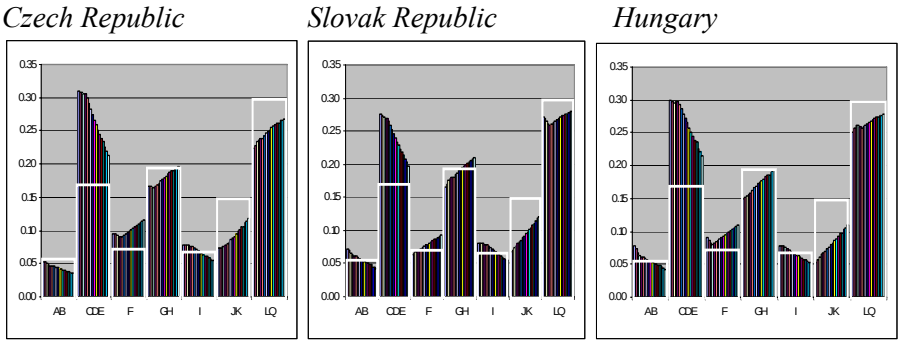
	Value added shares (in %)				Productivity (in % of EU-15)				Employment shares (in %)			
	2002	**2007**	**2012**	**2015**	**2002**	**2007**	**2012**	**2015**	**2002**	**2007**	**2012**	**2015**
Agriculture	5.4	5.1	4.8	4.6	76.6	78.6	80.4	81.5	6.2	5.4	4.7	4.3
Industry	27.8	27.1	26.5	26.2	40.8	46.2	51.5	54.5	30.1	26.5	23.2	21.5
Construction	3.7	3.9	4.0	4.1	33.7	35.5	37.4	38.5	8.3	9.3	10.3	10.9
Trade, Repair and Hotels	15.6	15.6	15.6	15.6	73.8	75.9	77.9	79.1	16.0	17.5	18.7	19.3
Transport	10.4	10.2	9.9	9.8	58.1	63.4	68.2	70.9	7.3	6.4	5.6	5.2
Business Services	18.0	18.6	19.2	19.5	90.2	91.9	93.3	94.1	6.7	8.3	9.9	11.0
Public Services	19.1	19.5	19.9	20.1	62.6	67.5	71.9	74.3	25.5	26.6	27.5	27.8

Source: Authors' calculations.

Summarizing, although the model implies a tendency towards the EU-15 in terms of productivity levels and value added shares, the deviations remain sizeable in the medium term. This would be even more relevant when accounting for potential specialization effects in the projections (for instance, one may expect a higher share of output in manufacturing due to automotive clusters in the Czech and Slovak Republics, or a lower share of public services in some countries); for caveats of the model and sensitivity analyses with respect to such issues see Stehrer (2005).

Let us now turn to the effects on employment levels and shares which result from the productivity and output dynamics. Chart 1 shows the resulting evolution of the employment shares by main sectors of the three economies (including historical data 1997–2002). In the individual country boxes, wide columns with white frames indicate the 2002 employment shares of the EU-15 while narrow columns show employment shares of the respective NMS in each individual year of the period 1997–2015.
Chart 1 reveals the common trends in employment shares. The most important trends are the declines in employment shares in industry, falling from about 30% to a level between 20% and 25%. Further, there will be increases in a number of service sectors which are underrepresented so far in terms of employment shares. This concerns in particular business services, where the deviations to the EU-15 are largest, as well as public services. Further the model also predicts rising shares in trade, repair and hotels in the three countries. Employment shares in transport will tend to fall over the period.

Chart 1: Employment Demand Scenarios by Sectors



Note: Agriculture (AB), Industry (CDE), Construction (F), Trade, repairs and hotels(GH), Transport (I), Business services (JK), Public services (LQ).

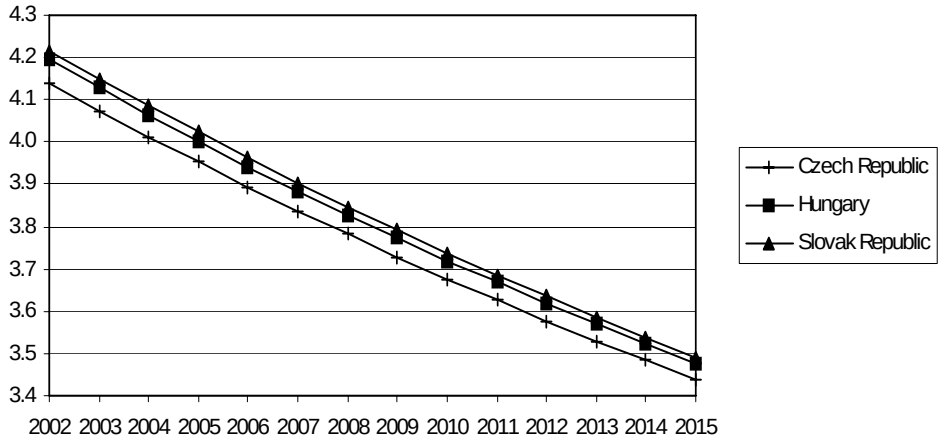
Source: Authors' calculations.

6.2 Productivity and GDP Growth versus Labour Demand

The results reported above do not tell us anything about the *level* of employment. Chart 2 shows those GDP growth rates in the NMS in individual years of the ten-year period which facilitate keeping the employment levels prevailing in 2002. These hypothetical growth rates are higher in the beginning mainly because of the productivity gap and are continuously falling over time for two reasons: first, the closing of the gap in productivity levels implies that the productivity growth rates become lower in general, and second, employment is shifting in the wake of

structural change. Thus the pressure on labour demand is reduced due to successful catching-up. On average, the hypothetical growth rates of GDP necessary to keep employment stationary is about 3.8–4% per year in all countries.
These can be compared with the growth rates for GDP per capita resulting from the NOBEII and the updated NOBEII study reported above. As population remains roughly constant in all three countries, the GDP per capita growth rates may be used as proxies for longer-term GDP growth rates. In the base scenario these growth rates are projected to be between 3.6% (Czech Republic) and 4.6% (Slovak Republic); in the 'high growth' scenario they range between 4.1% and 5.2%. For the latter scenario one could expect employment levels to be rising (Hungary, Slovak Republic) or to be almost stationary (Czech Republic). For the base scenario GDP growth would be too low for positive employment growth in the Czech Republic.

Chart 2: GDP Growth Rates Required to Keep Overall Employment Level Unchanged



Source: Authors' calculations.

On the other hand, it is interesting to look at the three countries' employment performance under the assumption of convergence in GDP per employee and different growth rates of GDP. According to the calculations above, we assume a GDP growth rate of 4% and 5%, respectively. For the second variable, we assume convergence parameters in GDP per employee of $\beta = -0.030$. This is in line with the econometric estimate of convergence for a larger group of countries. Table 21 presents the projections of employment levels for each of the two scenarios.

Table 21: Employment Forecasts (in ths.)

	Convergence parameter of GDP per employee : –0.030													
	GDP growth rate: 4% p.a.							GDP growth rate: 5% p.a.						
	Levels				2002 = 1			Levels				2002 = 1		
	2002	2007	2012	2015	2007	2012	2015	2002	2007	2012	2015	2007	2012	2015
CZ	4727	4737	4811	4884	1.002	1.018	1.033	4727	4970	5295	5531	1.051	1.120	1.170
HU	3859	3858	3910	3965	1.000	1.013	1.027	3859	4047	4303	4490	1.049	1.115	1.164
SK	2111	2108	2135	2164	0.999	1.011	1.025	2111	2212	2349	2450	1.048	1.113	1.161

Source: Authors' calculations.

In the first scenario (modest GDP growth) all three countries succeed in creating employment but only at very low rates. In the second scenario the GDP growth rate is assumed to be at 5% per year; one can see that this increase in the GDP growth rate of one percentage point has a quite strong effect on labour demand, and all countries show higher employment levels (about 10–12 percentage points higher compared to the first scenario) at the end of the simulation period than in 2002.

7. Conclusion

Summing up it can be stated that the longer-term perspectives for continued economic growth and structural change in the new EU Member States bordering Austria are good and that interesting perspectives for regional agglomeration effects – including Austria – can be expected.

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