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Employment, Education and Occupation Structures: A Framework for Forecasting

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Executive summary

This paper introduces a model for forecasting changes in employment levels and structures by sectors, occupational categories and educational attainment levels which is then applied to the new member states (NMS) and Bulgaria and Romania. The model is based on the following ideas: As these countries face lower productivity levels as compared to the EU-15, the scope for technical change and catching up is quite large. Thus, if these countries converge to the EU-15 productivity levels at given trajectories, real income levels are also changing, which implies changes in demand and thus output structures by Engel curve effects. The latter are modelled as convergence to the EU-15 output structures. These factors, i.e. changes in productivity levels and output structures, in turn imply changes in the level and structure of employment. For making the forecasts we estimated the speed of convergence in productivity levels by sectors and the sectoral output shares econometrically from a larger country sample (including mainly EU countries). From these estimates and the initial levels, forecasts of convergence patterns for productivity levels and output shares are calculated, which are presented for the period up to 2012. A further decomposition with respect to occupational categories and educational attainment levels allows to forecast labour demand with respect to these groups.

Let us summarize the most important results of this exercise:

(1) In terms of aggregate employment levels, the more advanced NMS (Slovenia, Czech Republic, Slovak Republic and Hungary) are already, or will be in the next few years, in a phase of rising employment levels although at low rates (i.e. unemployment rates or inactivity rates remain almost stable). Another group of countries, Poland and the Baltic states, show modest decreases in employment levels with structural adjustments taking place mainly due to the high initial share of employment in the agricultural sector. Finally, Bulgaria and Romania face severe declines of employment levels in the next decade (about 15% of employment in 2002) mainly caused by high productivity increases (due to the high initial gap) and the high initial share of output and employment in the agricultural sector.

(2) The structural shifts of employment patterns across sectors are very similar across countries: employment shares in agriculture and manufacturing are decreasing and the employment shares in the services sectors are increasing. Although the dynamic patterns are quite similar across countries, there are large differences in the magnitudes of these changes mainly depending on the initial share of employment in the particular sectors.

(3) With respect to occupational categories, the group suffering most from the ongoing restructuring are the blue-collar high-skilled and blue-collar low-skilled workers. For the first group an absolute decrease of demand is predicted for all countries; for the blue-collar low-skilled workers a decrease in demand is predicted for all countries except the more

successful NMS (Czech Republic, Hungary and Slovak Republic). Demand for the other groups (white-collar workers) are in most cases in absolute terms rising or at least stable.

(4) With respect to educational attainment levels, also a clear picture emerges: the group suffering most in relative terms are the low-educated employees. Demand for this group is slightly decreasing in the successful NMS Czech Republic, Hungary and Slovak Republic and modestly decreasing in Slovenia and Estonia. A strong decrease in demand for the low-educated employees is predicted for the other countries whereas demand for the other groups (medium-educated and highly educated) remains more or less stable or is even increasing in absolute terms.

(5) Scenarios with respect to the supply of employment by educational groups suggest that the overall labour force is declining and that the structure of supply is changing, with the share of low-educated decreasing and the share of highly educated increasing. This in general leads to an improvement in the overall labour market situation and especially so for the low-educated group, which is suffering most from the ongoing changes in labour demand. However, unemployment rates for this group still remain relatively high (compared to the other educational groups). Changes in the level of unemployment rates depend strongly on GDP growth, whereas the structure of unemployment rates is also influenced by changes in the sectoral structure and supply-side dynamics.

Keywords: *productivity convergence, labour demand, employment patterns, occupations, skill demand, supply and demand mismatches*

JEL classification: *C69, J11, J23, O10*

Robert Stehrer

Employment, education and occupation structures: a framework for forecasting

1 Introduction

The economies in the new EU member states (NMS) – the Czech Republic, Hungary, Slovak Republic, Slovenia, Poland, and the Baltic countries Estonia, Latvia and Lithuania – and of the EU candidate countries (CC-2) – Bulgaria and Romania – have already undergone rapid structural changes with respect to changes in the sectoral structure and uneven productivity dynamics. This has also implied changes in the structure of employment and labour demand as concerns sectoral employment shares, changing demand for occupations and educational attainment levels. Further, in the period of these changes demand for labour dropped in most countries, implying either high and persistent unemployment rates or rising inactivity rates. This decrease in demand for labour was mainly caused by rapid technological catching-up processes as well as changes in the sectoral structure of the economies. Although in the recent period (after 1995) most of the economies have performed relatively well as regards total GDP growth (compared to e.g. the EU-15 countries) GDP growth was not strong enough to compensate for the decrease in employment levels due to technical and structural change. While the main emphasis of the present paper is on forecasting future developments, we also highlight some of the historical trends with respect to productivity and structural developments in this chapter.

The forces mentioned above (i.e. GDP growth, productivity catching-up and structural change) are also the main components of the model introduced in this paper which is used as a forecasting framework for future developments. The basic idea is as follows: as all the countries mentioned above have generally lower productivity levels as compared to the EU-15 the scope for technical change and catching-up is quite large (for an early reference see e.g. Gerschenkron, 1952; the same idea can also be found in the recent convergence literature; see e.g. Barro and Sala-i-Martin, 1999). This is also the case when looking at the sectoral rather than the aggregate economy wide level. Thus, if these countries converge to the EU-15 productivity levels at a given trajectory, real income levels are also changing which implies changes in demand and thus output structures through Engel curve effects (i.e. in the case of non-homothetic preferences). Although we do not model this link (between real income levels and expenditure patterns) explicitly in this paper we allow for adjustment processes of sectoral output shares to the EU-15 structures. Also some potential country-specific deviations from a common pattern may be considered (e.g. due to existing comparative advantages, welfare state policies, etc.) which are analysed using sensitivity analysis at the end of the paper. Both these changes in productivity levels and output shares imply changes in the level and structure of employment. In order to construct

the forecasts we estimate the speed of convergence in productivity levels by sectors and in sectoral output shares econometrically from a larger country sample. Knowing the speed of convergence and the initial levels then allows us to forecast developments in productivity levels and output shares which, in a next step, allows to calculate the forecasts for labour demand by sectors and at the aggregate level.

The paper is structured as follows: in section 2 we introduce the methodology for the scenario analysis, i.e. the model and the econometric analysis used in the study. Further the data sources and classifications are summarized. In section 3 this framework is applied at the aggregate level and forecasts (also including sensitivity analyses) for total labour demand are presented. In section 4 this framework is generalized to allow for an application to a multisectoral economy, which also allows to analyse the employment effects of uneven productivity and output growth. The scenarios provide information not only on the development of total labour demand but also of labour demand by sectors. Further a decomposition analysis is presented which allows for analysing the most important factors in the restructuring process (such as productivity growth and changes in the output structure). In section 5 a further differentiation of the data with respect to occupations and educational attainment levels is made, which again allows for making forecasts for labour demand by occupational groups and educational attainment levels. Finally, in section 6 we compare the demand forecasts by educational attainment levels with supply forecasts for these groups, from which conclusions concerning potential demand-supply mismatches can be drawn. Section 7 concludes.

2 Methodology and data

2.1 Modelling and estimation of convergence

For modelling the convergence trajectories, we estimate a catching-up model with respect to productivity levels and output shares. For this we use a framework introduced by Verspagen (1991), which is summarized in this section in terms of productivity catching-up. Further we shall also use this framework when modelling the dynamics of labour demand over the next decade. Productivity in this study refers to labour productivity, i.e. output at constant prices divided by labour input (number of employees). For data reasons we cannot include other factors of production (such as capital) in the analysis.

The (labour) productivity gap of a country c with respect to a reference country L is expressed in logarithmic terms as

$$G^c = \ln(y^L / y^c) \tag{2.1}$$

where G^c denotes the productivity gap, y^c is the productivity level in country c, and y^L is the productivity level in country L to which we refer as the productivity leader. The growth rate of productivity in the leader country is assumed to be constant and exogenously given with $\hat{y}^L = \dot{y}^L / y^L = \gamma^L$. The rate of productivity growth in the follower country has an exogenous component and a catching-up term and is specified as

$$\hat{y}^c = \gamma^c - \beta G^c \exp(-G^c / \delta^c) \tag{2.2}$$

where $\beta < 0$ denotes the catching-up parameter and the term $\exp(-G^c / \delta^c)$ expresses a learning capability (depending on the gap and a learning parameter δ^c). Differentiating the technology gap (2.1) with respect to time and substituting into equation (2.2) yields the dynamic motion of the gap

$$\dot{G}^c = \frac{d}{dt} \ln\left(\frac{y^L}{y^c}\right) = \frac{\dot{y}^L}{y^L} - \frac{\dot{y}^c}{y^c} = (\gamma^L - \gamma^c) + \beta G^c \exp(-G^c / \delta^c). \tag{2.3}$$

Depending on the initial level of the technology gap and the learning parameter, the country either catches up or falls behind. In the case of $\delta^c \to \infty$ convergence of the countries to the productivity levels of the leader country is assured. In this paper we only refer to this special case. Under this assumption equation (2.3) simplifies to

$$\dot{G}^c = \alpha^c + \beta G^c \tag{2.4}$$

with $\alpha^c = \gamma^L - \gamma^c$. If the exogenous rates of productivity growth differ (where we assume that $\gamma^L \geq \gamma^c$) the follower country would stay behind the productivity level in the leading country at a constant rate. Setting $\dot{G}^c = 0$ this constant gap is given by $\widetilde{G}^c = -\alpha^c / \beta$. In this case the growth rate of productivity in the follower country becomes

$$\hat{y}^c = \gamma^c - \beta \widetilde{G}^c = \gamma^c + \beta \alpha^c / \beta = \gamma^L \tag{2.5}$$

i.e. productivity in the follower country grows at the rate of productivity in the leader country; however, there remains a constant gap to the leader in terms of productivity levels. Given the values for the difference of the exogenous growth rates α^c, the convergence parameter β and the initial gap equation (2.4) determines the trajectory of the convergence path. Some simple manipulations show that the productivity level in the follower country at time t is given by

$$y^c(t) = y^L(t) \exp\left(-G^c(t)\right) = y_0^L \exp\left(\gamma^L - G^c(t)\right) \tag{2.6}$$

where $G^c(t)$ is determined by equation (2.4). In the case of a constant gap the productivity level is then given by $y^c = y^L \exp(\alpha^c / \beta^c)$. From this one can easily see that for equal exogenous productivity growth rates, i.e. $\alpha^c = 0$, the follower country converges to the leader country also in levels, i.e. $y^c = y^L$.

For applying this model to data one has to estimate equation (2.4) to determine the parameters α^c and β. As we estimate equation (2.4) across countries we assume that these parameters are the same for all catching-up countries (i.e. the transition economies). The time trajectories of productivity convergence across countries then only differ in as much as the initial productivity gaps are different. For the estimation of equation (2.4) one has to estimate the long-run motion of the gap G^c. For each country the growth rate of the gap is estimated by

$$G^c = \phi^c \cdot t + c^c \tag{2.7}$$

where ϕ^c is taken as a measure of the growth of the gap, as $\dot{G}^c = \phi^c$, and c^c denotes a constant. This procedure has the advantage that it uses all the data available and not only the first and last observation. Inserting into equation (2.4) above, the convergence parameter is estimated by regressing the growth rate on the initial value of the gap

$$\phi^c = \alpha^c + \beta G_0^c . \tag{2.8}$$

This framework was introduced here for convergence in productivity levels. A similar approach is used when studying convergence of sectoral value added shares. In this case, instead of the productivity level of the leader, we use the arithmetic mean of value added shares of the EU-15 as the target level for estimating the speed of convergence in shares.[1]

2.2 Dynamics of labour demand

The framework sketched above yields estimates of the speed of convergence in productivity levels and value added shares. Given the initial levels of productivity and value added shares in the follower countries and the levels and exogenous growth rates of these variables in the leader countries, the time trajectories for these variables can be determined. Let us first discuss labour demand at the aggregate level; the application for a multisectoral framework is discussed in section 4.3.

[1] There is a large literature on the econometric analysis of convergence processes; the above framework was criticized for econometric reasons and a number of alternative estimation methods (e.g. time series models, dynamic panel estimations, etc.) were suggested. We have also used a dynamic panel framework but the results with respect to the speed of convergence (i.e. the implicit half-time) does not differ very much. So we decided to stick to the simple framework introduced above as this is also in line with the model outlined above.

Labour demand is determined by labour input per unit of output $l^c = 1/y^c$ (i.e. the inverse of labour productivity) times the volume of output at constant prices Y^c, i.e. $L^c = l^c Y^c$. Taking derivates with respect to time, the growth rate of labour demand can be expressed as $\hat{L}^c = \hat{l}^c + \hat{Y}^c$ and is thus determined by productivity and output growth. Productivity growth is already determined by the analysis above; the second component is total GDP growth. Under the assumptions of full employment and a constant workforce (i.e. constant participation rate and constant population) the growth rate of the economy would be determined by the growth rate of the labour input coefficient as $0 = \hat{L}^c = \hat{l}^c + \hat{Y}^c$ or $\hat{Y}^c = -\hat{l}^c$. (In this sense the model could be interpreted as a standard neoclassical growth model, introduced by Solow, 1956; for an overview of the economic growth literature see Barro and Sala-i-Martin, 1995). However, this simulation strategy does not seem to be appropriate for the economic dynamics going on in the NMS as, first, unemployment rates are still quite high; second, part of the population not yet in the workforce could start working if labour demand is rising (i.e. participation rates are not constant) and thus the supply of labour is elastic; and third, hidden unemployment in parts of the economies (e.g. in agriculture) means again that labour supply is not a constraint on economic growth. Thus a more appropriate modelling strategy is to assume that the total GDP growth rate is exogenously determined (which could be influenced by the fiscal and monetary policies pursued in the individual countries, the growth rates of the main trading partners, etc.). Throughout the study we shall apply this assumption of an exogenously determined total GDP growth rate and provide sensitivity analyses of the scenarios with respect to different GDP growth rates.

2.3 Data

The data we use for this study are taken from the new version of the OECD STAN database and the LFS database for employment data for NMS and CC-2. The (new) OECD STAN database provides data for value added at constant prices and employment for a larger sample of countries and over a longer time period; in general we use data from 1975 onwards. From this database we only include the 'old' member states (EU-15) for determining the catching-up parameters. Data for the NMS and the CC-2 are provided by the National Accounts (taken from the wiiw database on national statistics). These countries are included from 1995 onwards. Among the old EU member states, Ireland is missing for data availability reasons, while we partly included also Norway in the sample. As for the new EU member states, we have not included Malta and Cyprus. Appendix Table A.2 provides information on the sample of countries. The sectoral breakdown used in this study is presented in Appendix Table A.1. As one can see, the economy is divided into seven sectors, ranging from Agriculture to Public Services. This breakdown was mainly determined by statistical and data availability reasons. Detailed data on employment are taken from the LFS database, available from 1998 onwards. In a later

stage of this study we also use a breakdown of employment by occupational categories (ISCO-88) and educational levels (ISCED); the classifications are given in Tables A.3 and A.4. For a detailed analysis and description of the LFS data for related aspects of this study see Landesmann et al. (2005).

3 Aggregate productivity convergence and labour demand

As mentioned above, we start with the simple labour demand equation $L = lY$ where L denotes labour demand, l is labour input per unit of output (value added) – i.e. the inverse of labour productivity – and Y denotes total output (in our case value added). In terms of (constant) growth rates this can be written as $\hat{L} = \hat{l} + \hat{Y}$. Under the assumption that productivity converges as modelled above, one can calculate first the critical value of output growth to keep labour demand constant, or use these estimates to produce forecasts for labour demand given the growth rate of total GDP. For the latter case we shall present the scenarios and sensitivity analyses. Let us, however, first compare labour demand, productivity and value added growth in the EU-15 and the new member states (including Bulgaria and Romania) and, second, regression results for the estimation of the speed of convergence at the aggregate level.

3.1 Aggregate productivity convergence

Table 3.1 reports the average growth rates of value added, value added productivity (value added per employed person), employment and output for the EU-15 and for each of the NMS and CC-2. For the EU-15 the growth rates are calculated for the time period from 1975 (or later, depending on data availability) to 2002 whereas for the NMS and CC-2 the period 1995 to 2002 is considered. The second part of the table reports the growth rates of these variables for all countries in the period 1997 to 2002.

One can see that in the case of the EU-15, output growth exceeded – in most cases – productivity growth to a small extent; the difference can be seen in the employment growth rates, which are positive in most cases. On average output was growing over the entire period at a rate of 2.5%, and productivity at a rate of 2%, which results in employment growth of 0.5%.[2] For the NMS, productivity growth was higher than output growth on average. which leads to lower employment levels. The exceptions to this are Hungary and Slovenia only. One can also see that productivity growth in the NMS and CC-2 is higher than in the EU-15, which implies that catching-up in productivity levels is taking place. In the period 1997-2002 the productivity growth rate of the NMS was almost 5%, that of the CC-2 even 6%; however, the total GDP growth rate was lower, at about 4% per year.

[2] It has to be noted that we do not distinguish between full and part-time employment, and in this dataset we use only the number of employees.

Although the latter growth rate exceeds the growth rate of the EU-15, it does not suffice to compensate for falling labour demand due to overall productivity catching-up.

Table 3.1

Growth rates of labour productivity, output and employment

		Total period			1997-2002		
Group	**Country**	**Productivity**	**Output**	**Employment**	**Productivity**	**Output**	**Employment**
EU-15	**A**	0.022	0.025	0.003	0.016	0.024	0.008
	B	0.018	0.021	0.003	0.006	0.019	0.014
	D	0.016	0.018	0.002	0.012	0.021	0.009
	DNK	0.016	0.018	0.003	0.017	0.025	0.008
	FIN	0.027	0.025	-0.003	0.017	0.036	0.018
	F	0.018	0.022	0.004	0.009	0.028	0.018
	UK	0.020	0.024	0.004	0.015	0.026	0.011
	I	0.016	0.021	0.004	0.005	0.020	0.015
	L	0.022	0.055	0.033	-0.002	0.047	0.049
	NL	0.011	0.024	0.013	0.008	0.031	0.023
	S	0.022	0.020	0.000	0.013	0.031	0.018
	E	0.012	0.027	0.008	0.005	0.034	0.029
	EL	0.029	0.020	0.005	0.032	0.037	0.005
	P	0.027	0.030	0.003	0.019	0.034	0.015
	***Mean*[1)]**	*0.020*	*0.025*	*0.006*	*0.012*	*0.029*	*0.017*
NMS	**CZ**	0.022	0.014	-0.008	0.026	0.018	-0.007
	EE	0.069	0.056	-0.013	0.062	0.052	-0.011
	HU	0.032	0.042	0.010	0.031	0.043	0.012
	LT	0.073	0.043	-0.034	0.073	0.039	-0.034
	LV	0.053	0.054	0.001	0.056	0.053	-0.003
	PL	0.050	0.039	-0.011	0.052	0.031	-0.021
	SI	0.037	0.040	0.004	0.038	0.040	0.002
	SK	0.040	0.034	-0.006	0.040	0.031	-0.009
	***Mean*[1)]**	*0.047*	*0.040*	*-0.007*	*0.047*	*0.038*	*-0.009*
CC-2	**BG**	0.060	0.043	-0.017	0.075	0.061	-0.015
	RO	0.016	-0.002	-0.018	0.046	0.019	-0.027
	***Mean*[1)]**	*0.038*	*0.021*	*-0.018*	*0.061*	*0.040*	*-0.021*

Note: 1) Arithmetic mean over country group.

For the calculation of employment scenarios we have to estimate the coefficient of productivity convergence β. For this we calculate the gap (value added per employed person) as defined in equation (2.1) and regress this measure on a linear time trend (see equation (2.7)) which is done for each country separately. This yields an estimate of the motion of the gap ϕ^c which is used as the dependent variable in equation (2.8). For the initial level of the gap G_0^c we used the first year available for each country of the EU-15 and 1995 (or later if not available) for the NMS and CC-2. We dropped Luxembourg from

the sample as this country has very high productivity levels but data are not available for the whole period, which causes econometric problems. From the remaining countries the productivity leaders turned out to be France and Belgium over the period considered.

Table 3.2 presents the results from the cross-country regressions. In column [1] we used the whole sample whereas in column [2] we dropped some countries which performed badly in terms of convergence over the period considered. These countries are Germany (after reunification), Portugal, Latvia, and the CC-2 (Bulgaria and Romania).

Table 3.2

Cross-country estimates of the convergence parameter

	Total sample	**Subsample**
Slope	-0.030***	-0.043***
	(-6.51)	(-10.77)
Constant	0.004	0.008**
	(0.91)	(2.80)
R^2	0.658	0.872
R^2 adj.	0.643	0.865
F-value	42.36	115.89
Obs.	24	19
(t-values in brackets)		

The regressions show a R^2 of 0.65 for the first and 0.87 for the second estimation. The estimated coefficients for convergence are –0.030 for the total sample and –0.043 for a reduced sample (i.e. dropping some outliers) and are highly significant in both cases. The half time of convergence (i.e. the time period used to close the gap to half of the initial gap) is given by $\ln 0.5 / \beta$. Inserting the point estimates above, the implicit half time is 23 and 16 years, respectively. These estimates suggest faster convergence than e.g. the study by Barro and Sala-i-Martin (1999) which suggest a half-time for conditional convergence of about 27 to 30 years for a much wider sample of countries. As the countries included in our sample are quite homogenous and as the endowment of the NMS and CC-2 with physical and human capital is at a sufficient level facilitating easy technology transfer, these estimates seem to be reasonable for the productivity catching-up process taking place in these countries.

Table 3.3 presents an overview of population size and value added data for the NMS, the CC-2 and the EU-15. This table also provides information on the value added per capita and per employed person, respectively, as well as the gap to the weighted average of the EU-15. In terms of value added per employed person, the countries furthest behind are Bulgaria and Romania, reaching about a quarter of the EU-15 level only; the countries closest to the EU-15 are the Czech Republic, Hungary and Slovakia, reaching about 55%,

and Slovenia with about 65% of the EU-15 average. (In this way these countries outperform Greece and Portugal in the ranking.)

Table 3.3

Productivity levels and gaps

	Value added				
	Level	**per capita**	**in % of EU-15**	**per employed person**	**in % of EU-15**
CZ	122109	14272	60.49	26143	56.15
EE	12017	11525	48.84	21141	45.41
HU	97475	12556	53.22	25607	55.00
LT	23982	8586	36.39	16896	36.29
LV	14014	7717	32.71	14882	31.96
PL	294298	9496	40.25	20272	43.54
SI	26239	15810	67.01	29554	63.48
SK	53158	12225	51.81	25521	54.82
BG	33315	4951	20.98	11660	25.04
RO	127177	6913	29.30	11670	25.07
EU-15[1)]	*7302410*	*23595*	*100.00*	*46557*	*100.00*

Total value added 2002 at constant prices 1995, million, from SNA data (Source: National accounts data).

Population (15+ and 15-64) (Source: LFS supply data).

Employed persons (Source: LFS demand data).

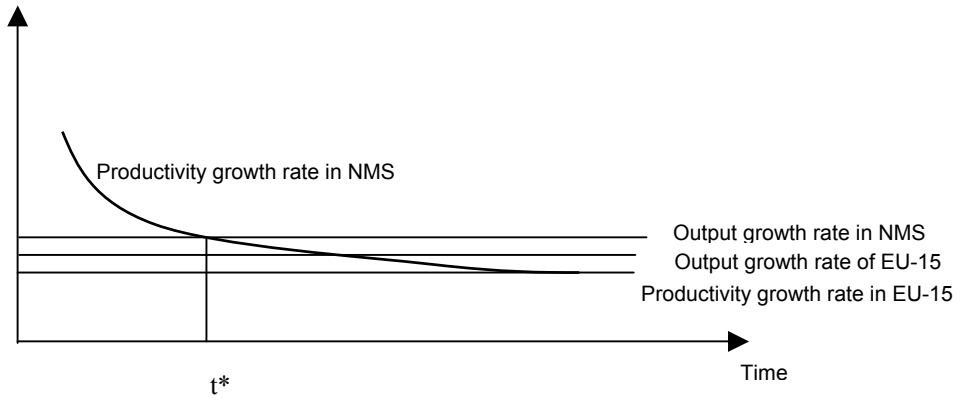
1) Without Ireland.

3.2 Implications for labour demand and employment

The implications for labour demand under the assumption that the countries follow the specific path of productivity convergence specified above are sketched in a schematic way in Figure 3.1.

Figure 3.1

Productivity convergence and labour demand



For the EU-15 we assume a constant long-run growth rate of productivity and output as depicted on the vertical axis. As was shown above (see Table 3.1) output growth was higher than productivity growth, leading to employment creation. Under the assumptions of the model for the follower countries (i.e. convergence of productivity to the EU level and equal exogenous productivity growth rates) the productivity growth rate of the NMS and CC-2 is relatively high at the beginning of the catching-up period (and highest for countries showing the largest gap) but – as the gap is closing over time – it decreases over time. The effect on labour demand and employment then depends on the growth rate of output (GDP). If productivity is growing faster than GDP, demand for labour will decrease. Even if the GDP growth rates are higher in the NMS and CC-2 (as indicated in the figure) it is thus likely that productivity growth exceeds GDP growth at the beginning, leading to negative employment effects. As already discussed, this was the case for most of the NMS and CC-2 over the past decade. However, at a certain point in time the countries may enter a phase when employment is created; in the figure this is indicated by t^*.

Figure 3.2

Implied productivity growth rates

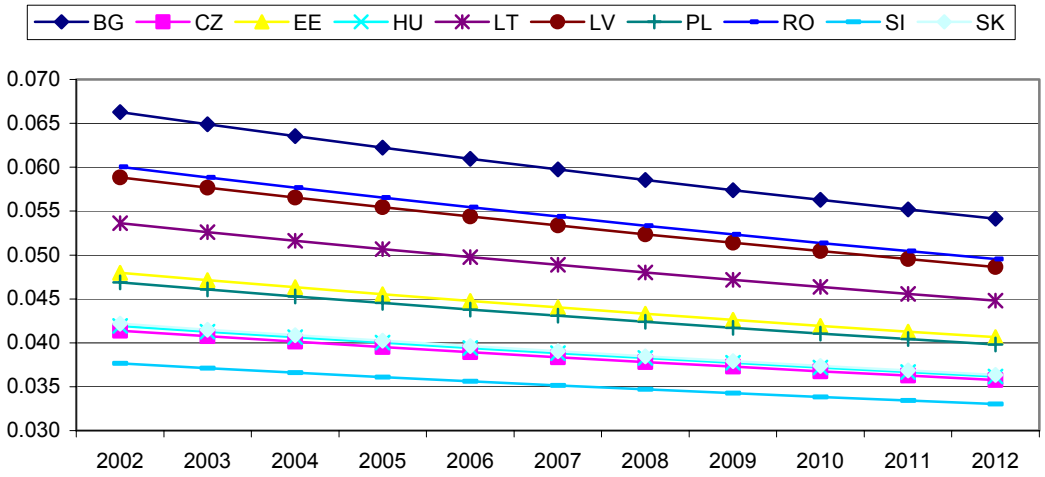


Figure 3.2 shows the productivity growth rates using the initial gap of the year 2002 and a convergence parameter of $\beta = -0.030$. Further we assumed a long-term productivity growth rate of the EU-15 (to which the growth rate of the follower countries converge) of $\gamma^L = 0.020$. One can see that the projected productivity growth rates range from 0.066 (Bulgaria) to 0.038 (Slovenia) depending on the initial gaps of productivity. Under the assumption of a GDP growth rate of 4% as a benchmark scenario for medium-term performance, one can see that only some countries (in particular Slovenia, the Czech Republic, Hungary and Slovakia) move to the stage of positive employment growth in the period up to 2012. In all other countries the productivity growth rate remains above this benchmark of 4% over the whole simulation period (until 2012) and thus one has to expect

a quite long period of jobless growth or even job destruction. Two countries, Estonia and Poland, are expected to reach this benchmark at the end of the simulation period. Another way of interpretation this figure is the following: The numbers show the GDP growth rates that would have to be reached in order to keep employment at constant levels. The pressure for high GDP growth rates diminishes over time when the gap to the EU-15 is closing and thus the potential for productivity catching-up becomes smaller.

Before going on to calculate the employment effects of this productivity trajectory, let us briefly mention potential caveats of this analysis. The most important caveat is that it assumes that output growth and productivity growth are independent of each other. The relationship between these two variables can go in either direction with a positive mutual influence: higher output growth may imply higher productivity growth (i.e. the Kaldor-Verdoorn effect) and a higher productivity growth rate may imply a higher output growth rate (e.g. via export multipliers, etc.). Further, there is also a relationship between the level of employment, real income growth and effective home demand. The creation of jobs may thus lead to higher overall GDP growth even at lower productivity growth (and the reverse with a loss of jobs in the wake of high productivity growth) which would bring a Keynesian aspect into this analysis which is not captured by the simple framework above. Taking account of these relationships in a detailed manner is, however, beyond the scope of this study and would involve a more explicit dynamic model. (For a dynamic model taking account of such structural relationships at an aggregate level, see Landesmann and Stehrer, 2002, for a closed economy and Landesmann and Stehrer, 2003, for an open economy framework.) However, the essential point of the problem of jobless growth caused by productivity convergence is clear from the simple framework introduced above.

Concluding, some of the countries considered are on the verge of creating employment although for some of them (the less advanced economies) one has to expect further losses in employment over a longer period. In the next section we shall present some calculations of the prospective labour demand based on the calculations above.

3.3 Projections of labour demand in the aggregate scenario

Using this framework let us now present four scenarios for the dynamics of the aggregate employment levels for each country. As argued above, there are two crucial parameters in this framework: the trend growth rate of GDP and the growth rate of labour productivity depending on the exogenous growth rate of productivity in the EU-15 (as the productivity leader) and the convergence parameter β and the initial levels of the productivity gaps of the NMS. For the first variable we show scenarios with 4% and 5% growth rate of GDP, which is in line with the past growth experience of these countries. For the second variable, we assume convergence parameters of $\beta = -0.030$ and $\beta = -0.040$, respectively, which

are in line with the econometric estimates reported above. Table 3.4 presents the forecasted employment levels for the four scenarios which are calculated under the assumptions given above.

Table 3.4

Employment forecasts (in ths.)

Convergence parameter: -0.030

	GDP growth rate: 4 % p.a.					GDP growth rate: 5 % p.a.				
	Levels			2002 = 1		Levels			2002 = 1	
	2002	**2007**	**2012**	**2007**	**2012**	**2002**	**2007**	**2012**	**2007**	**2012**
CZ	4727	4737	4811	1.002	1.018	4727	4970	5295	1.051	1.120
EE	581	566	561	0.974	0.965	581	594	617	1.021	1.062
HU	3859	3858	3910	1.000	1.013	3859	4047	4303	1.049	1.115
LT	1421	1350	1309	0.950	0.921	1421	1416	1441	0.997	1.014
LV	987	917	872	0.929	0.883	987	962	960	0.974	0.972
PL	13800	13502	13432	0.978	0.973	13800	14164	14780	1.026	1.071
SI	890	907	934	1.019	1.050	890	952	1028	1.069	1.155
SK	2111	2108	2135	0.999	1.011	2111	2212	2349	1.048	1.113
BG	2797	2516	2328	0.899	0.832	2797	2639	2562	0.944	0.916
RO	9768	9025	8546	0.924	0.875	9768	9467	9404	0.969	0.963

Convergence parameter: -0.040

	GDP growth rate: 4 % p.a.					GDP growth rate: 5 % p.a.				
	Levels			2002 = 1		Levels			2002 = 1	
	2002	**2007**	**2012**	**2007**	**2012**	**2002**	**2007**	**2012**	**2007**	**2012**
CZ	4727	4609	4595	0.975	0.972	4727	4835	5057	1.023	1.070
EE	581	546	528	0.940	0.909	581	573	581	0.986	1.000
HU	3859	3751	3731	0.972	0.967	3859	3935	4105	1.020	1.064
LT	1421	1293	1219	0.910	0.858	1421	1357	1341	0.955	0.944
LV	987	873	803	0.884	0.814	987	916	884	0.928	0.895
PL	13800	13046	12682	0.945	0.919	13800	13685	13956	0.992	1.011
SI	890	887	900	0.996	1.010	890	930	990	1.045	1.112
SK	2111	2049	2036	0.971	0.964	2111	2150	2240	1.018	1.061
BG	2797	2374	2112	0.849	0.755	2797	2491	2325	0.890	0.831
RO	9768	8580	7853	0.878	0.804	9768	9001	8642	0.921	0.885

In the first scenario (modest GDP growth and modest speed of convergence) only the Czech Republic, Hungary, Slovenia and Slovakia succeed in creating employment, but only at very low rates. The most successful country is Slovenia where employment rises by about 5% in the period 2002 to 2012. All other countries experience – according to this scenario – further losses in employment. These losses amount to more than 10% of the employment level in 2002 for Latvia, Romania and Bulgaria (with more than 15%). In the second scenario the GDP growth rate is assumed to be at 5% per year; one can see that

this increase of the GDP growth rate of one percentage point has a quite strong effect on labour demand and most countries show higher employment levels at the end of the simulation period than in 2002. The only exceptions are Latvia, Bulgaria and Romania; in this case losses of employment are less than 10%. In the third scenario (modest GDP growth and higher speed of productivity convergence) we assumed a convergence parameter of $\beta = -0.040$ (which is similar to the estimated coefficient for the reduced sample). In this case all countries with the exception of Slovenia will experience losses in employment until 2012. Finally, under the assumption of higher GDP growth (5% per year) and higher speed of convergence, a number of countries will again experience positive employment effects over the longer run and for most countries even higher employment levels at the end of the simulation period as compared to the first scenario are observed.

4 The sectoral dimension

The aggregate analysis above may however conceal important issues with regard to the sectoral structure of the economy and changes in the structure of output. In this section the framework is reformulated such that the sectoral dynamics in the economies play a role (for a more elaborate theoretical model see Stehrer, 2002a, for a closed economy and Stehrer, 2002b, for internationally integrated economies; this framework was extended by Landesmann and Stehrer, 2004, to allow e.g. for non-homothetic preferences). The sectoral dimension is important as a destruction of jobs in a particular sector – due to productivity growth and changes in demand – may imply high adjustment costs to workers (e.g. geographical mobility, requirement of new skills, etc.). Furthermore, as skill intensities and occupational structures differ across sectors, inter-sectoral and inter-occupational mobility becomes an important issue when studying the development of labour demand with respect to educational attainment levels and occupational categories. For this analysis we distinguish seven sectors (see Appendix Table A.1 for industry groupings). From a methodological point of view an additional variable to be considered are the value added shares of the particular sectors in the economy, denoted by α_i^c with $\sum_i \alpha_i^c = 1$, and their dynamics over time. Further, labour productivity changes at different rates in the particular sectors because of different exogenous growth rates (i.e. the sectoral labour productivity growth rates of the leaders), sector-specific convergence parameters and sector-specific initial gaps in productivity levels.

4.1 Convergence of sectoral productivity levels

4.1.1 Dynamics of productivity, output and employment at the sectoral level

For the sectoral convergence patterns of labour productivity we can use the same framework as introduced in section 2 above; the only difference is that we have to index the equations (2.1) – (2.8) with an index i for the particular sectors.

To give a first overview we present data on productivity growth, output growth and employment growth for two groups of the old EU member states (where we separated the cohesion countries Spain, Greece and Portugal), the NMS and the CC-2 in Table 4.1. For the EU-12 (EU-15 without cohesion countries) and EU-3 (cohesion countries) the whole period is considered, whereas for the NMS and CC-2 only the period 1997-2002.

Let us refer mainly to the growth rates in employment, which result from the difference between the growth rates of output and productivity. Of course, the overall impact of a sector on total labour demand also depends on the relative size of this sector in the economy, which shall be discussed in more detail below (see the shift-share analysis in section 4.3).

In terms of growth rates, the most important changes occurred in the agricultural sector (AB). This is the case for the EU-12 and the EU-3 countries as well as for most of the NMS – less so, however, for the CC-2. The average growth rate is about –0.03 for the EU countries (over the long period), but partly much higher (in absolute terms) for the NMS, with growth rates ranging from –0.04 (Hungary) to –0.09 (Slovakia). Exceptions to this are Poland and Romania with growth rates of –0.30 and Bulgaria with only –0.012. This shedding of labour out of agriculture (AB) was mainly caused by rather high productivity growth rates in this sector, lying above the country average of labour productivity growth (exceptions to this are Estonia and Romania) but also by a slow output dynamics which was below the growth rate of the total GDP. Estonia, Latvia and Slovenia even experienced negative output growth rates. Only the Czech Republic and Bulgaria have a higher output growth rate in the agricultural sector than in the total economy. Negative growth rates in output can be observed for Estonia, Latvia, Slovenia and Romania.

For the industrial sector (CDE) – consisting of Mining and Quarrying (C), Total Manufacturing (D) and Electricity, Gas and Water (E) – the losses in employment are less dramatic in terms of growth rates. The growth rates of employment in this sector are negative for almost all countries (the exception is Hungary) and quite high (in absolute terms) for Lithuania, Poland and the CC-2, Bulgaria and Romania. For this sector the growth rates of productivity are also rather high and sometimes higher than for agriculture, which was partly compensated by higher output growth rates as well. Exception to this are

Table 4.1

Growth rates by sectors

	Agriculture			Industry			Construction			Trade, Repair, Hotels			Transport			Business Services			Public Services			Total		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
EU-12	0.046	0.018	-0.027	0.034	0.020	-0.013	0.011	0.009	-0.002	0.015	0.025	0.010	0.041	0.046	0.006	-0.004	0.035	0.038	0.003	0.019	0.016	0.019	0.026	0.007
EU-3	0.043	0.014	-0.031	0.029	0.019	-0.004	0.020	0.020	0.016	0.011	0.021	0.016	0.059	0.042	0.001	-0.009	0.037	0.044	0.007	0.029	0.022	0.023	0.026	0.006
NMS	0.071	0.011	-0.059	0.059	0.040	-0.019	0.015	0.006	-0.009	0.047	0.054	0.007	0.056	0.049	-0.007	0.012	0.050	0.038	0.025	0.027	0.002	0.047	0.038	-0.009
CC-2	0.058	0.037	-0.022	0.075	0.028	-0.046	0.072	0.051	-0.021	0.033	0.045	0.012	0.065	0.044	-0.022	0.063	0.064	0.000	0.052	0.042	-0.010	0.061	0.040	-0.021
CZ	0.094	0.047	-0.047	0.018	0.006	-0.012	-0.069	-0.095	-0.026	0.056	0.044	-0.012	0.086	0.078	-0.008	0.029	0.039	0.010	-0.038	-0.025	0.014	0.026	0.018	-0.007
EE	0.050	-0.014	-0.064	0.085	0.068	-0.017	0.104	0.074	-0.029	0.052	0.061	0.008	0.074	0.065	-0.009	0.014	0.049	0.035	0.039	0.028	-0.011	0.062	0.052	-0.011
HU	0.049	0.009	-0.041	0.048	0.058	0.009	0.017	0.064	0.047	0.007	0.036	0.030	0.030	0.033	0.003	-0.010	0.051	0.061	0.029	0.029	0.000	0.031	0.043	0.012
LT	0.047	-0.027	-0.074	0.098	0.056	-0.042	0.017	-0.026	-0.043	0.087	0.065	-0.022	0.069	0.032	-0.036	0.068	0.060	-0.007	0.048	0.040	-0.008	0.073	0.039	-0.034
LV	0.109	0.034	-0.075	0.059	0.035	-0.024	0.047	0.089	0.042	0.077	0.109	0.032	0.033	0.038	0.005	0.023	0.089	0.066	0.008	0.020	0.012	0.056	0.053	-0.003
PL	0.057	0.028	-0.029	0.074	0.030	-0.043	0.021	-0.012	-0.033	0.052	0.049	-0.003	0.087	0.060	-0.027	-0.027	0.027	0.054	0.034	0.017	-0.017	0.052	0.031	-0.021
SI	0.046	-0.007	-0.053	0.057	0.048	-0.009	0.032	0.044	0.012	0.025	0.035	0.010	0.018	0.043	0.025	0.019	0.039	0.020	0.013	0.040	0.027	0.038	0.040	0.002
SK	0.115	0.022	-0.093	0.031	0.020	-0.011	-0.052	-0.090	-0.038	0.023	0.034	0.012	0.054	0.045	-0.009	-0.021	0.045	0.066	0.064	0.064	0.000	0.040	0.031	-0.009
BG	0.099	0.087	-0.012	0.079	0.034	-0.046	0.087	0.064	-0.023	0.031	0.065	0.034	0.097	0.083	-0.014	0.021	0.065	0.044	0.083	0.059	-0.024	0.075	0.061	-0.015
RO	0.018	-0.014	-0.031	0.070	0.023	-0.047	0.056	0.038	-0.018	0.034	0.025	-0.009	0.034	0.004	-0.030	0.106	0.062	-0.043	0.020	0.025	0.005	0.046	0.019	-0.027

Column (1): Productivity

Column (2): Output

Column (3): Employment

EU-12,EU-3: Total period (arithmetic average of growth rates)

NMS and CC-2: 1997-2002 (arithmetic average of growth rates)

Source: OECD STAN, own calculations.

the Czech and Slovak Republics where productivity as well as output growth were low. For construction (F) the evidence is rather mixed: the Czech Republic, Estonia, Lithuania, Poland, the Slovak Republic as well as Bulgaria and Romania experienced negative employment trends, whereas the remaining countries (Hungary, Latvia and Slovenia) experienced positive ones. For the first group this was mainly caused by negative output growth rather than high productivity growth (an exception to this is Estonia).

In the fourth sector, Trade, Repairs and Hotels (GH), only the Czech Republic, Lithuania, Poland and Romania show a negative trend, mainly caused by high productivity growth rates, as output growth in this sector is positive for all countries. A similar picture can be seen for Transport (I) where output growth is positive and relatively high. Losses in employment which occurred in the Czech Republic, Estonia, Latvia, Poland, Slovakia and Bulgaria thus are mainly caused by high productivity growth. Relatively low output growth but even lower productivity growth can be observed for Hungary, Latvia and Slovenia. In Romania output growth is almost zero so that even relatively low productivity growth results in losses in employment. The next sector, Business Services (JK) – consisting of Financial Intermediation (J) and Real Estate, Renting and Business Activities (K) – is often regarded as a sector for potential job creation as it is characterized by high labour intensity, high (potential) output growth and low (labour) productivity growth rates. This has so far been the case especially for Hungary, Latvia, Poland and Slovakia, with employment growth rates of about 5-6%. The other countries have positive growth rates as well (the exceptions are Latvia with a slightly negative growth rate and Romania with –0.04) and – given the negative employment growth rates at the aggregate level – Finance and Business Services can be considered as one of the job creating sectors also in the NMS. Finally, Public Services (LQ) was growing in employment terms in the Czech Republic, Latvia, Slovenia and Romania but at very modest rates. In most cases productivity growth thus outweighed the modest output growth in this sector. The only exception is the Czech Republic, where productivity was declining faster than output.

Compared to the growth rates of the EU-15 countries, the NMS and CC-2 have on average higher productivity growth rates in all sectors with the exception of Construction (F) for the NMS, and Transport (I). Output growth is notably higher in Industry (CDE), Trade, Repair and Hotels (GH) and Business Services (JK) in the NMS and in most sectors for the CC-2. However, as productivity growth is larger than output growth in most sectors the overall effect on employment is negative. From these results we conclude that a framework similar to the one for the total economy can appropriately be applied for the disaggregated economy.

4.1.2 Sectoral productivity levels and potential for catching-up

Before going on to the estimation results of the convergence parameters we look at the productivity gaps for each sector and country which in combination with the sector-specific convergence parameters β_i determine the growth rates. Table 4.2 presents the sectoral productivity levels in absolute values and in percentage of the EU-15.

These productivity levels in percentage of EU-15 averages are plotted in Figure 4.1. Here we have also ranked the countries with respect to the gap of the total economy (the economy closest to the EU-15, Slovenia, is ranked first). The ranking of the countries is as follows: Slovenia, Czech Republic, Hungary, Slovakia, Poland, Estonia, Lithuania, Latvia, Romania, Bulgaria. The productivity levels as percentage of the EU-15 range from 67% (Slovenia) to 26% (Bulgaria). This ranking, however, shows up only partly in the productivity levels for the particular sectors.

Table 4.2

Productivity gaps

Value added per employed person

	AB	CDE	F	GH	I	JK	LQ	Total
CZ	30132	27982	9861	27719	36755	60228	11355	25647
EE	15387	20602	24036	17860	26092	46379	11985	20591
HU	22387	28189	19262	17383	30510	59013	17634	25183
LT	8627	23208	15676	21267	23959	34412	10707	17056
LV	7218	19984	14967	14122	25651	29115	7688	14329
PL	6551	29561	20922	29933	26311	30243	15814	21358
SI	10381	29902	27505	24719	34897	60088	27036	29059
SK	22002	23055	11301	24353	35823	66806	18713	24989
BG	8513	13053	13537	8853	19253	24141	6691	11185
RO	6570	19666	20153	16483	21108	55866	9200	13772
***EU-15*[1)]**	*26529*	*54437*	*32164*	*30304*	*64521*	*75641*	*30301*	*43528*

in % of EU-15

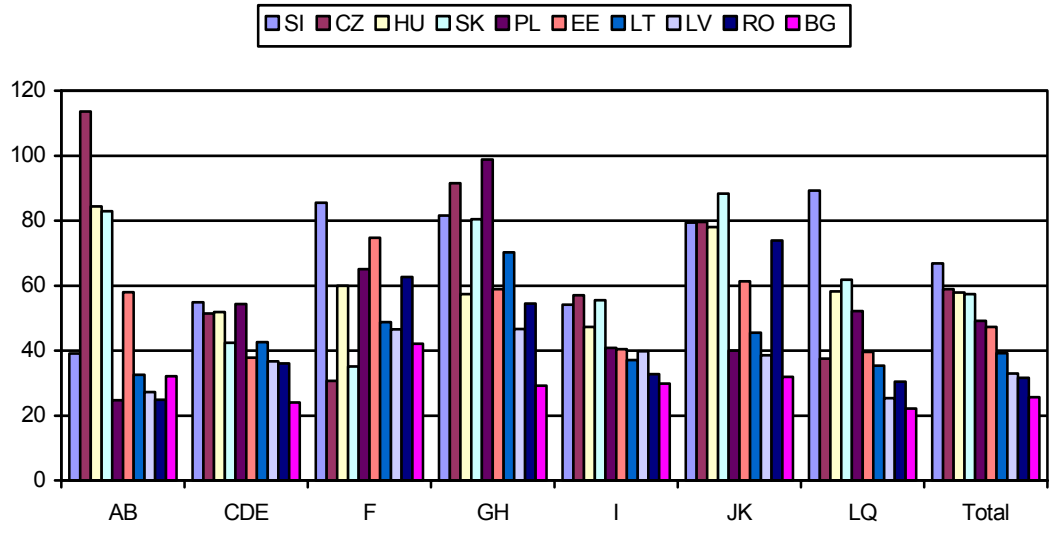
	AB	CDE	F	GH	I	JK	LQ	Total
CZ	113.6	51.4	30.7	91.5	57.0	79.6	37.5	58.9
EE	58.0	37.8	74.7	58.9	40.4	61.3	39.6	47.3
HU	84.4	51.8	59.9	57.4	47.3	78.0	58.2	57.9
LT	32.5	42.6	48.7	70.2	37.1	45.5	35.3	39.2
LV	27.2	36.7	46.5	46.6	39.8	38.5	25.4	32.9
PL	24.7	54.3	65.0	98.8	40.8	40.0	52.2	49.1
SI	39.1	54.9	85.5	81.6	54.1	79.4	89.2	66.8
SK	82.9	42.4	35.1	80.4	55.5	88.3	61.8	57.4
BG	32.1	24.0	42.1	29.2	29.8	31.9	22.1	25.7
RO	24.8	36.1	62.7	54.4	32.7	73.9	30.4	31.6

Note: 1) Austria not included in AB.

As for Agriculture (AB), the Czech Republic, Hungary and Slovakia reach more than 80% of the EU level.[3] In between are Estonia with 58% and Slovenia with about 39%. The other countries show levels of about 30%. The productivity levels for the industry sectors (CDE) are much closer together in a range between 55% for Slovenia and 24% for Bulgaria. Here also the ranking as given for the total economy applies more or less, the only notable exception being Poland. In the construction sector (F) one can see no clear picture with regard to the overall ranking of countries and the range is from 86% (Slovenia) to about 30% (Czech Republic). With regard to Trade, Repairs and Hotels (GH), which shows the highest productivity level relative to the EU-15 on average (almost 70%), the ranking applies in the sense that countries with higher overall productivity levels have also a higher productivity level in this sector. The main exception to this is Hungary with a level of less than 60% (compared to 80% to 100% for the other leading countries). The country with the lowest productivity level is again Bulgaria, reaching less than 30%. In the Transport sector (I) the levels are again closer together and the overall ranking applies more or less; only Hungary performs relatively better. In Business Services (JK) there is a group of five countries (Slovenia, Czech Republic, Hungary, Slovak Republic and Romania) reaching a level of more than 75% relative to the EU-15. Here also Estonia performs reasonably well with about 60%. Finally, in Public Services (LQ) the overall ranking also applies but with the exception of the Czech Republic. The leading country is Slovenia with almost 90%, and the lowest ranking country again Bulgaria reaching slightly more than 20%.

Figure 4.1

Value added productivity in per cent of EU-15



[3] The Czech Republic even shows a higher productivity level than the EU average. On the one hand, this may reflect the structure of agriculture in the Czech Republic (large scales) as compared to other EU countries; on the other hand, there may be data and measurement problems which shall not be dealt with at this stage.

4.1.3 Convergence performance at the sectoral level

These descriptive results imply that there is a sizeable potential for productivity catching-up especially in Industry (CDE), Public Services (LQ) and Transport (I) for almost all countries, whereas for the other sectors the scope for catching-up varies widely across countries. These different structures of the economies with respect to sectoral productivity gaps are accounted for in our framework, as a larger gap implies higher productivity growth in the particular sectors modelled by the convergence equations. Let us turn to the estimation of the speed of convergence in the particular sectors analogous to the aggregate case discussed in section 3. Let us discuss the results for each of the sectors.[4]

Table 4.3 reports the estimates of the speed of convergence for the particular sectors where we present the results for various samples. (We have partly dropped countries which performed particularly badly or well over the period.)

For Agriculture (AB) we found no significant convergence for the whole sample. However, Romania, Slovenia and Greece were falling behind during the period observed. Among these countries Romania and Slovenia showed a volatile performance in terms of catching up over the period and thus the estimate of the growth rate of the gap may not be reliable. Greece on the other hand seems to be on a low-productivity convergence path. Dropping these countries from the sample gives the estimate reported in Table 4.3, column [1]. Still the estimate is not significant, for the reason that another group of countries (Austria, Portugal, Poland, Latvia and Lithuania) exhibit very slow growth rates although having a very high gap. For Austria data are not reliable (as already mentioned above). Latvia and Lithuania again show a very volatile dynamics of the gap, whereas Poland and Portugal seem to be on a lower productivity convergence path. One reason for this (as well as for Greece) may be that these sectors still play a role as large sectors in which workers not elsewhere employed find jobs (hidden unemployment). Dropping these five countries from the sample then yields a significant convergence parameter of –0.022.

For the industry sector (CDE) the convergence parameter with –0.031 is significant for the whole sample. For Construction (F) the gap does not play a role at all for productivity growth. Even when dropping the outliers Latvia and Slovakia, which were falling behind quite fast, the convergence parameter remains insignificant. We have nonetheless reported the regression for this sector in Table 4.3. For Trade, Repair and Hotels (GH) there is a group of countries which are falling behind quite rapidly. These countries are Bulgaria, Romania, Hungary and Germany (including the eastern part). Dropping these

[4] For other studies considering convergence at the sectoral level see Bernard and Jones (1996) and the discussion on this in Sørensen (2001) as well as the reply by Bernard and Jones (2001). A further study on productivity convergence in service sectors is Gouyette and Perelman (1997).

Table 4.3

Sectoral convergence parameters of productivity

	Agriculture (AB)		Industry (CDE)
	(1)	(2)	(1)
Slope	-0.005	-0.022**	-0.031***
	(-0.83)	(-2.20)	(-4.54)
Constant	-0.015**	-0.007	0.014
	(-2.13)	(-0.95)	(1.81)
R^2	0.035	0.256	0.484
R^2 adj.	-0.016	0.203	0.460
F-value	0.68	4.82	20.61
Obs.	21	16	24
Dropped:	GRC, RO, SI	GRC, RO, SI AUT, PL, PRT, LT, LV	

	Construction (F)	Trade, Repair and Hotels (GH)	
	(1)	(1)	(2)
Slope	-0.005	-0.018*	-0.022***
	(-0.28)	(-1.80)	(-2.97)
Constant	0.004	-0.002	0.004
	(0.33)	(-0.40)	(1.01)
R^2	0.004	0.153	0.371
R^2 adj.	-0.046	0.106	0.329
F-value	0.08	3.24	8.84
Obs.	22	20	17
Dropped:	LV, SK	BG, DEU, HU, RO	BG, DEU, HU, RO LT, SWE, NOR

	Transport (I)		Business Services (JK)	
	(1)	(2)	(1)	(2)
Slope	-0.038***	-0.033***	-0.021***	-0.041***
	(-5.00)	(-8.08)	(-1.81)	(-3.67)
Constant	0.003	0.006*	0.001	0.008
	(0.58)	(0.048)	(0.08)	(1.10)
R^2	0.556	0.793	0.129	0.403
R^2 adj.	0.534	0.781	0.090	0.373
F-value	25.03	65.27	3.26	13.50
Obs.	22	19	24	22
Dropped:	RO, SI	RO, SI EE, DEU, GRC		BG, PL

	Public Services (LQ)	
	(1)	(2)
Slope	-0.031***	-0.035***
	(-3.76)	(-4.88)
Constant	0.000	0.000
	(-0.00)	(-0.00)
R^2	0.391	0.532
R^2 adj.	0.363	0.510
F-value	14.10	23.86
Obs.	24	23
Dropped:		CZ

(t-values in brackets)

countries from the sample the coefficient of convergence becomes –0.018 and significant at the 10% level. The detailed results are reported in Table 4.3 in column [1] of sector (GH). Further, Lithuania and Sweden show a quite rapid productivity development which is much faster than the average over the countries. Finally, Norway turns out to be the leader over the whole period (and thus no convergence can be measured). Dropping these three countries from the sample as well a significant convergence parameter of –0.022 is found (for details see Table 4.3, column [2] of sector GH).

In the Transport sector (I) there is significant convergence for the whole sample although Romania and Slovenia are falling behind over the period considered. The convergence parameter for the whole sample is –0.029 and is highly significant. Dropping the outliers Romania and Slovenia the coefficient of convergence becomes –0.036 (again a highly significant). The detailed results for this regression are reported in Table 4.3, column [1] of sector I. Again there is a group of countries which performed much better than the average, namely Greece, Estonia and Germany. Dropping these countries from the sample as well yields a highly significant coefficient of –0.033. In this case the regression also has a quite high fit (the R^2 becomes 0.79); these results are reported in column [2] of sector I.

In Business Services (JK) the whole sample shows convergence at a rate of –0.021 but only significant at the 10 per cent level. In this sector Poland was falling behind and for Bulgaria almost no convergence at all takes place although the initial gaps for these countries are quite high. Dropping these two countries from the sample the coefficient of convergence becomes –0.041 and highly significant. Here one has however to mention that overall productivity growth in this sector is very low (and even negative for the EU15 average as can be seen in Table 4.1). Finally, in Public Services (LQ) the parameter is also significant for the whole sample. The Czech Republic may be seen as an outlier as this country falls back over the period. Dropping it from the sample yields a little higher coefficient of convergence and a higher overall fit as can be seen in Table 4.3. The coefficient of convergence is also high at a level of –0.035.

Summarizing, we have found significant convergence in productivity levels for all sectors with the exception of Construction (F), at least when removing some countries from the sample. The performance of these countries may be seen as caused by country-specific characteristics or particular developments in the period observed, which is particularly the case for some of the NMS and CC-2 countries. Not taking into account the outliers, the coefficients of convergence are particularly high for Business Services (LQ) and Transport (I) (in the first estimation reported in column [1]) at a level of almost –0.04 (implying a half-time of about 17 years), in a medium range for Industry (CDE) and Public Services (LQ) with a parameter of about –0.30 (implying a half-time of about 23 years), and

at a lower level for Agriculture (AB) and Trade, Repair and Restaurants (GH) with a parameter of about –0.02 (implying a half-time of about 35 years).

4.2 Convergence of GDP shares

4.2.1 Comparisons of output structures

The sectoral level of employment not only depends on productivity and its movement over time but also on the share of output of the particular sector in the economy. Let us first look at the sectoral structure of the NMS and CC-2 compared to the EU-15 average. The shares are presented in Table 4.4.

Table 4.4

Employment and output shares

Employment shares

	AB	CDE	F	GH	I	JK	LQ
SI	9.30	32.67	6.04	16.78	6.42	7.53	21.26
CZ	4.79	30.73	8.93	16.60	7.72	7.65	23.58
HU	6.22	27.10	7.00	17.81	8.00	7.96	25.90
SK	6.18	30.13	8.27	15.98	7.26	6.73	25.45
PL	19.33	22.47	6.18	16.02	6.04	7.18	22.79
EE	6.65	24.74	6.67	17.85	9.34	8.94	25.81
LT	17.82	20.86	6.63	17.01	6.22	4.90	26.56
LV	15.03	19.63	6.13	17.59	8.79	5.32	27.51
RO	36.40	25.02	4.47	10.52	4.96	2.28	16.35
BG	25.82	23.78	4.06	15.37	7.30	5.64	18.04
EU-15	5.27	16.89	7.09	19.49	6.20	15.05	30.02

Output shares

	AB	CDE	F	GH	I	JK	LQ
SI	3.32	33.62	5.71	14.27	7.71	15.57	19.78
CZ	5.62	33.53	3.43	17.94	11.06	17.97	10.44
HU	5.53	30.33	5.36	12.29	9.69	18.65	18.14
SK	5.44	27.80	3.74	15.58	10.41	17.98	19.06
PL	5.93	31.10	6.05	22.45	7.44	10.16	16.87
EE	4.97	24.76	7.78	15.49	11.83	20.15	15.02
LT	9.02	28.38	6.09	21.21	8.73	9.89	16.68
LV	7.57	27.38	6.41	17.33	15.74	10.80	14.76
RO	17.37	35.73	6.54	12.59	7.60	9.26	10.92
BG	19.65	27.75	4.92	12.16	12.56	12.16	10.79
EU-15	2.84	22.07	5.49	15.40	8.75	25.09	20.46

Figure 4.2 presents figures with regard to the sectoral structure in terms of value added and employment shares for the EU-15, the NMS and CC-2 for the year 2002. Given the

productivity levels in 2002 and the output shares the employment levels and shares are determined. For completeness these employment shares are plotted in Figure 4.3. In these tables and figures the countries are again ranked according to their aggregate productivity level compared to the EU-15 as already introduced above. Further the light shaded rectangles present the EU-15 shares in the particular sectors.

Figure 4.2

Sectoral value added shares

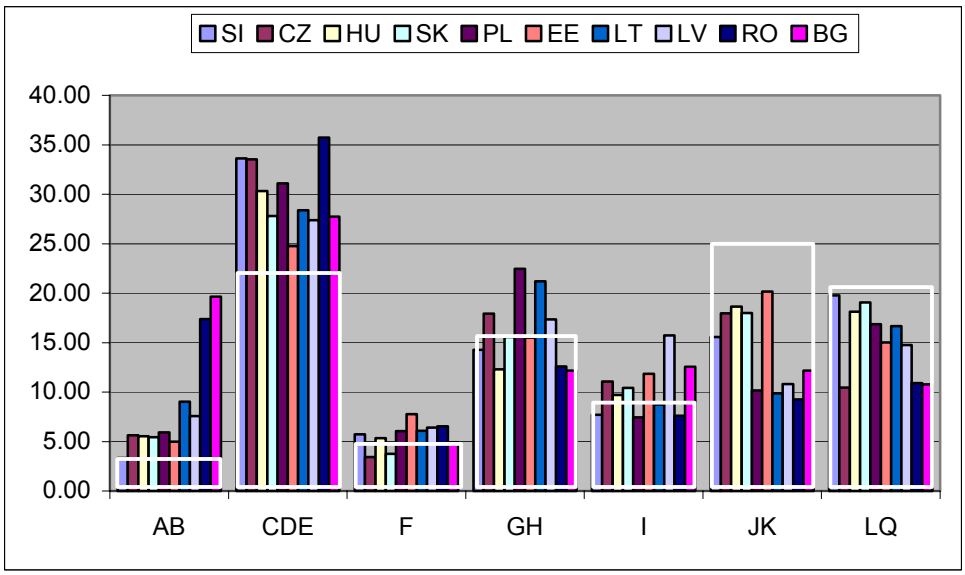
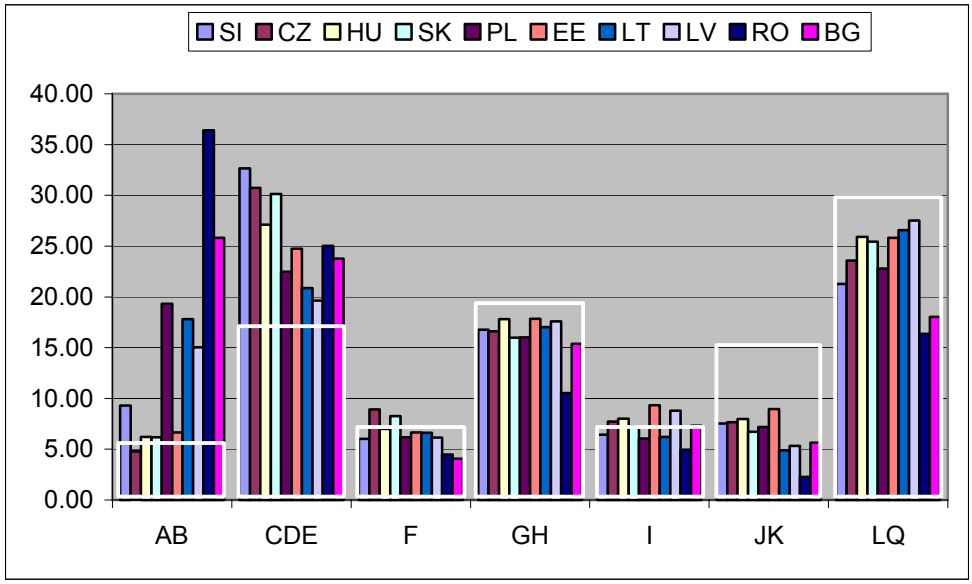


Figure 4.3

Sectoral employment shares



In Agriculture (AB) all countries have higher output shares as compared to the EU-15. Slovenia is closest to the EU-15, with only about 3%, followed by a group consisting of the Czech Republic, Hungary, Slovakia, Poland and Estonia with shares of slightly about 5%. Lithuania and Latvia have shares of about 9% and 8% respectively. The countries with the highest shares are the CC-2 (Bulgaria and Romania) with shares of 15% and almost 20% respectively. As concerns the output share in Industry (CDE) again all countries have shares above the EU-15 average. Romania holds the highest share (more than 35%), followed by Slovenia and the Czech Republic with about 33% each. Hungary and Poland also still have shares above 30% (as compared to 23% of the EU-15) whereas the remaining countries (Slovakia and the three Baltics Estonia, Latvia and Lithuania) show shares between 25% and 30%. Estonia, with less than 25%, has the lowest shares of all NMS and CC-2. In Construction (F) no clear pattern emerges: the EU-15 average is at about 6%; below this level are the Czech Republic, Hungary, the Slovak Republic and Bulgaria; slightly above the EU-15 average is Slovenia, and somewhat higher are Poland, Estonia and the three Baltic countries. For the service industries again no clear pattern can be found for Trade, Repair and Hotels (GH) and Transport (I). In the sector Trade, Repair and Hotels (GH) the Czech Republic and Latvia are about 3 percentage points above the EU-15 average of 15%; Poland and Lithuania have the highest output share with more than 20%. Clearly below the EU-15 average are Hungary and the CC-2 Bulgaria and Romania. Similarly, no clear-cut pattern can be seen in Transport (I) where the EU-15 average is about 9%. While Slovenia, Poland and Romania are below this average (with about 7%) the other countries register higher shares. Latvia has the highest share in this sector, with more than 15%. In the remaining two sectors all countries have lower output shares as compared to the EU-15. In Business Services (JK) the output share of the EU-15 is 25% and thus the highest compared to all other sectors. Closest to this is Estonia with about 20%; the shares of the Czech Republic, Hungary and Slovakia are at about 18%, followed by Slovenia with 15%. In Poland, Latvia, Lithuania and the CC-2 the shares are only about 10%, i.e. 15 percentage points below that of the EU-15. Finally, in Public Services (LQ) only Slovenia comes close to the EU-15 share of 21%. The output shares of the Czech Republic, Romania and Bulgaria are only slightly more than 10%, those of the other countries range in between.

As mentioned above, the productivity level and the sectoral output shares determine the sectoral employment shares. For the EU-15, in terms of output structure, the ranking with respect to the size of the sector in the economy is Business Services (JK), Industry (CDE), Public Services (LQ), Trade, Repair and Hotels (GH), Transport (I), Construction (F) and finally Agriculture (AB); in terms of employment shares, the most important sector is Public Services (LQ) with an employment share of about 30%, followed by Trade, Repair and Hotels (GH) with almost 20% and Business Services (JK) with 15%. The remaining sectors are of similar size with 5% to 7% each. Given their productivity performance, the NMS and CC-2 have higher employment shares in Agriculture (AB) and Industry (CDE), and show a

mixed pattern for Construction (F) and Transport (I). The employment shares are lower in the services sectors: but whereas in Trade, Repair and Hotels (GH) the difference is rather small (with the exception of Romania), it is quite large in Business Services (JK) and partly also in Public Services (LQ). In the latter sector it is particularly high for Romania and Bulgaria.

Under the assumptions of productivity convergence and convergence in output shares employment shares must convergence as well; one thus can expect a major shift away from Industry (CDE) and for some countries Agriculture (AB) towards the Business and Public Services (JK and LQ). Given our framework the speed of this employment restructuring depends on the speed of productivity convergence in the particular sectors (determined by the coefficients of convergence and the initial levels) and the convergence behaviour of output shares, to which we turn next. Further, the restructuring of an economy in terms of employment shares may also take place along different paths: in the extreme cases, a change in employment structures may take place by job destruction in the sectors having higher than average shares (i.e. Agriculture and Industry) without creation of new jobs in the other sectors (particularly in services). This kind of restructuring implies high social costs in terms of high unemployment rates or an increase in the inactivity rates. The other extreme would be job creation e.g. in the services sectors and may imply even rising activity rates for the economy as a whole. The framework we use in this paper will tell us also something on job creation/destruction in the individual sectors. Before, however, we have to estimate the speed of convergence of output shares, and whether convergence takes place at all.

4.2.2 Convergence in output shares

Let us now address the question whether a convergence process takes place with respect to the output structures in our country sample and at which speed these structures may converge. One has first to note that the data for the EU-15 countries show less convergence in shares than in productivity levels. Although there are some common trends, the dynamics of the shares exhibit hysteresis effects, i.e. shares converge – if at all – at very low rates. But there are also common trends (e.g. a decline in the share of agricultural output). This means that we find convergence using the concept of β-convergence for some sectors but do not find σ-convergence (which is not reported here).[5] There are some reasons for this: first, countries may have different structural patterns as the endowment with natural resources (including tourism) differs across countries, the building of sectoral clusters (e.g. finance activities, industrial zones, ...) implies different specialization patterns of countries, etc. Secondly, non-linearities in the

[5] Note that β-convergence does not imply σ-convergence, but σ-convergence would imply β-convergence.

dynamics of the shares could imply that common trends are observed across countries, but the variance of the shares of particular industries across countries first rises and falls later on (e.g. when this follows an S-shaped pattern over time). Thus, although we use the concept of β-convergence for the dynamics in the shares as well, we have to be cautious when using the estimates in the scenario analysis later on; in particular, we shall take into account some specificities of the NMS and CC-2 in their adjustment paths by reporting sensitivity analyses with respect to different convergence paths and using results from the shift-share analysis presented below.

For the dynamics in shares we estimated a similar equation as for productivity convergence. The only difference is that, instead of the leader country, we take the arithmetic mean of shares of the EU-15 as the benchmark. The equation implies that countries/sectors with above-'average shares' are expected to show a decline in this share and countries/sectors with below-'average shares' are expected to show rising shares. In Table 4.5 we report the results of the regressions for each sector. Again we have dropped some outliers from each of the regressions. In this table we further report an 'equilibrium share' calculated by setting the left-hand side of the regression equation to zero.

In Agriculture (AB) the coefficient is significant and implies a half-time of 25 years. The equilibrium share is 2.14, although one has to note that the constant is not statistically different from zero. In this regression we have dropped Bulgaria, which shows a rather high growth rate of output. In Industry (CDE) we dropped Hungary, Romania and Slovenia: Hungary has an exceptionally high growth rate of output whereas Romania and Slovenia are characterized by high initial shares but low albeit positive growth rates. On the other hand, Greece – which was also dropped – has a very low initial share and even a negative growth rate. The regression shows a highly significant coefficient of –0.050 (implying a half-time of 14 years) and an equilibrium share of about 25%. For construction (F) we find no significant coefficients at all, even after dropping the outliers Bulgaria and the Czech Republic. In the next sector, Trade, Repair and Hotels (GH), we find a significant coefficient at the 10% level implying a half-time of 35 years. For this we had to drop a number of NMS showing quite high (positive) growth rates of output shares in this sector. For Transport (I) we find again a highly significant coefficient of convergence. Here the outliers are Bulgaria, the Czech Republic, Germany and Estonia with quite high growth rates. The implied half-time is 27 years and the equilibrium share is about 10%. In Business Services (JK) convergence does not take place at all and output shares vary widely also across the EU-15 countries. Finally, in Public Services (LQ) significant convergence at a half-time of about 24 years is found and the equilibrium share is at about 20%. Here, again, we dropped a number of NMS (the Czech Republic, Estonia, Hungary, Latvia and Poland) experiencing negative growth rates and starting from low initial shares as compared to the EU-15 average as discussed above.

Table 4.5

Sectoral convergence parameters of value added shares

	Agriculture (AB)	Industry (CDE)
Slope	-0.028***	-0.050***
	(-5.46)	(-3.39)
Constant	0.001	0.012***
	(1.60)	(3.09)
R^2	0.587	0.390
R^2 adj.	0.567	0.356
F-value	29.79	11.52
Obs.	23	20
Dropped:	BG	GRC, HU,RO, SI
Half-time:	25	14
Equ. share (in %)	2.14	24.70
	Construction (F)	**Trade, Repair and Hotels (GH)**
Slope	-0.026	-0.020*
	(-1.25)	(-1.98)
Constant	0.001	0.003*
	(0.72)	1.90
R^2	0.072	0.187
R^2 adj.	0.026	0.139
F-value	1.56	3.91
Obs.	22	19
Dropped:	BG, CZ	LT, LV, PL, SK, SV
Half-time:	27	35
Equ. share (in %)	3.91	15.00
	Transport (I)	**Business Services (JK)**
Slope	-0.026***	0.009
	(-5.01)	(0.97)
Constant	0.002***	0.000
	(6.02)	(0.02)
R^2	0.583	0.041
R^2 adj.	0.559	-0.003
F-value	25.13	0.93
Obs.	20	24
Dropped:	BG, CZ, DEU, EE	
Half-time:	27	
Equ. share (in %)	9.38	
	Public Services (LQ)	
Slope	-0.029***	
	(-5.49)	
Constant	0.006***	
	(5.11)	
R^2	0.640	
R^2 adj.	0.618	
F-value	30.16	
Obs.	19	
Dropped:	CZ, EE, HU, LV, PL	
Half-time:	24	
Equ. share (in %)	20.34	

(t-values in brackets)

Summarizing, there seems to be a tendency of convergence in shares with the exception of two sectors: Construction (F) and Business Services (JK). Convergence takes place at rates implying half-times of about 25 years; an exception to this is Industry (CDE) where the implied half-time is only 14 years. For the scenario analysis and a forecasting period of ten years this means that, if a country has a 10 percentage points higher output share in a particular sector, it would have an about 7.5 percentage points higher output share after ten years.

4.3 Scenarios for sectoral labour demand and implications for aggregate employment levels

Similar to the aggregate framework we start with a simple labour demand equation $L_i = l_i \alpha_i Y$ where L_i denotes labour demand in sector i, l_i is labour input per unit of output (value added) – i.e. the inverse of labour productivity – and Y denotes total output (in our case value added). Additionally we have to take into account the sectoral structure of the economy; this is done by the share of a particular sector i in total GDP. In terms of growth rates this equation can be written as $\hat{L}_i = \hat{l}_i + \hat{\alpha}_i + \hat{Y}$. The growth rates of the input coefficient and value added shares are determined by the convergence dynamics; for total GDP growth we use as a base scenario a constant growth rate of 4% per year. Table 4.6 summarizes the values for exogenous growth rates and convergence parameters used in the simulations. The level of employment in each sector is then determined by $\mathrm{L_i(t) = L_i(0)\exp(\int \hat{L}_i dt)}$; the aggregate employment level sums up as $L(t) = \sum_i L_i(t)$.

Table 4.6

Parameter values in scenarios

	Productivity convergence			Convergence in value added shares		
	Exogenous	**Coefficient**	**Half-time**	**Exogenous**	**Coefficient**	**Half-time**
AB	0.046	-0.020	35	-0.007	-0.012	58
CDE	0.034	-0.030	23	0.002	-0.039	18
F	0.011	-0.010	69	0.002	-0.011	63
GH	0.015	-0.020	35	-0.001	-0.023	30
I	0.041	-0.035	20	-0.002	-0.023	30
JK	0.000	-0.040	17	0.000	-0.016	43
LQ	0.019	-0.035	20	0.001	-0.039	18

For the interpretation of the results we shall also refer to a decomposition of the changes according to a shift-share analysis. As $L_i = l_i \alpha_i Y$ (i.e. labour demand equals labour input per unit of output times the output share times total GDP) changes in employment can be decomposed in the following manner:

$$\Delta L_i = \Delta l_i \alpha_{i,1997} Y_{1997} + l_{i,1997} \alpha_{i,1997} \Delta Y + l_{i,1997} \Delta \alpha_i Y_{1997} + l_{i,1997} \Delta \alpha_i \Delta Y + \\ + \Delta l_i \alpha_{i,1997} \Delta Y + \Delta l_i \Delta \alpha_i Y_{1997} + \Delta l_i \Delta \alpha_i \Delta Y \quad (4.1)$$

where the particular terms can be described as:

$\Delta l_i \alpha_{i,1997} Y_{1997}$	productivity effect
$l_{i,1997} \Delta \alpha_i Y_{1997}$	structural effect
$l_{i,1997} \alpha_{i,1997} \Delta Y$	output effect
$l_{i,1997} \Delta \alpha_i \Delta Y$	structural x output effect
$\Delta l_i \Delta \alpha_i Y_{1997}$	productivity x structural effect
$\Delta l_i \alpha_{i,1997} \Delta Y$	productivity x output effect

The change in the employment level of sector i can be decomposed into changes due to labour productivity changes (or changes in the input of labour per unit of output) and changes in sectoral output. The change in output can itself be decomposed into a change in total GDP at constant shares and changes of the sectoral share of output. These two effects are referred to as the structural effect and the output effect. Further there are some mixed effects: the structural-output effect, the productivity-structure effect and the productivity-output effect. The seventh term is a mixed term which is $\Delta l_i \Delta \alpha_{i,2002} \Delta Y$. Summarizing across sectors *i* gives the aggregate effect of the particular terms.[6]

Tables 4.7a and 4.7b present the decomposition analysis for the EU-15 countries, the NMS and the CC-2. Whereas in Table 4.7a we show the decomposition of changes in absolute values, in Table 4.7b the changes of the various components relative to the aggregate employment level in 1997 have been calculated. Further these relative changes has been divided by the number of years (i.e. 5). This allows for comparing the decomposition analysis of the past evidence from 1997-2002 to the projections presented below.

Overall one can see that the productivity effect is negative whereas the output effect is positive, as expected. However, while for the EU-15 the output effect outweighs the productivity effect, for most of the NMS and CC-2 the magnitudes of these two effects are more similar. The output effect is lower than the productivity effect in absolute terms in Poland and Slovenia and particularly so in Romania. In Lithuania and the Slovak Republic the effects are of a similar magnitude; in the other countries the output effect is larger in absolute terms. The structural effect is negative in all countries (the exceptions are Belgium and the Slovak Republic where the effect is positive but small and Bulgaria where the

[6] The results for individual sectors can be requested from the author.

Table 4.7a

Decomposition analysis (levels)

	Employment		Productivity	Output	Structural	Structure output	Productivity output	Productivity structure	Mixed
	level 1997	Total change in employment	effect	effect	effect	effect	effect	effect	effect
A	3924300	142200	-264354	502462	-53593	-6862	-33848	-1424	-182
B	3886300	249800	-96506	357581	1259	116	-8880	-3452	-318
D	37200000	1463000	-980440	3798566	-960212	-98028	-100093	-178563	-18230
DNK	2636100	104000	-170589	329737	-25927	-3243	-21338	-4124	-516
FIN	2153900	192300	-137062	415345	-43256	-8341	-26430	-6669	-1286
FIN	22900000	2069762	-947598	3291728	-108511	-15620	-136408	-12088	-1740
UK	28200000	1547647	-2006958	4047100	-180199	-25887	-288313	1666	239
I	22200000	1672000	-179941	2129680	-258870	-24817	-17250	21169	2029
NL	7544000	907094	-266232	1273758	-41610	-7026	-44952	-5856	-989
NOR	2219700	101500	-117256	240910	-743	-81	-12726	-7762	-842
S	4015300	337600	-202849	671596	-68410	-11442	-33928	-14879	-2489
E	14100000	2192000	-186140	2530145	-106557	-19055	-33286	5847	1046
EL	3784100	140800	-430829	758263	-44545	-8926	-86330	-39015	-7818
P	4626300	374361	-325166	873659	-106490	-20110	-61406	11670	2204
EU-15	*159390000*	*11494064*	*-6311918*	*21220531*	*-1997664*	*-249322*	*-905188*	*-233481*	*-28891*
CZ	4934400	-173200	-104733	410730	-173967	-14481	-8718	-260359	-21672
EE	610400	-26800	-153051	183814	-4266	-1285	-46089	-4553	-1371
HU	3646300	224300	-478328	857230	-37768	-8879	-112453	3642	856
LT	1574300	-168200	-383923	379602	-51907	-12516	-92573	-5545	-1337
LV	982000	-4000	-209304	292263	-11395	-3391	-62293	-7614	-2266
PL	15200000	-1398000	-3224929	2510948	-79939	-13225	-533546	-49174	-8136
SI	901000	2000	-147725	195190	-14285	-3095	-32003	3220	698
SK	2206100	-78900	-335696	396529	586	105	-60339	-67884	-12202
BG	3157435	-178873	-981703	1121060	49988	17748	-348557	-27607	-9802
RO	11100000	-1815700	-2058745	844554	-450201	-34409	-157350	37579	2872

Table 4.7b

Decomposition analysis as percentage of employment in 2002 (annual changes)

	Employment		Productivity	Output	Structural	Structure	Productivity	Productivity	Mixed
	level	Total change in				output	output	structure	
	1997	employment	effect	effect	effect	effect	effect	effect	effect
A	3924300	0.72	-1.35	2.56	-0.27	-0.03	-0.17	-0.01	0.00
B	3886300	1.29	-0.50	1.84	0.01	0.00	-0.05	-0.02	0.00
D	37200000	0.79	-0.53	2.04	-0.52	-0.05	-0.05	-0.10	-0.01
DNK	2636100	0.79	-1.29	2.50	-0.20	-0.02	-0.16	-0.03	0.00
FIN	2153900	1.79	-1.27	3.86	-0.40	-0.08	-0.25	-0.06	-0.01
FIN	22900000	1.81	-0.83	2.87	-0.09	-0.01	-0.12	-0.01	0.00
UK	28200000	1.10	-1.42	2.87	-0.13	-0.02	-0.20	0.00	0.00
I	22200000	1.51	-0.16	1.92	-0.23	-0.02	-0.02	0.02	0.00
NL	7544000	2.40	-0.71	3.38	-0.11	-0.02	-0.12	-0.02	0.00
NOR	2219700	0.91	-1.06	2.17	-0.01	0.00	-0.11	-0.07	-0.01
S	4015300	1.68	-1.01	3.35	-0.34	-0.06	-0.17	-0.07	-0.01
E	14100000	3.11	-0.26	3.59	-0.15	-0.03	-0.05	0.01	0.00
EL	3784100	0.74	-2.28	4.01	-0.24	-0.05	-0.46	-0.21	-0.04
P	4626300	1.62	-1.41	3.78	-0.46	-0.09	-0.27	0.05	0.01
EU-15	*159390000*	*1.44*	*-0.79*	*2.66*	*-0.25*	*-0.03*	*-0.11*	*-0.03*	*0.00*
CZ	3157435	-0.70	-0.42	1.66	-0.71	-0.06	-0.04	-1.06	-0.09
EE	4934400	-0.88	-5.01	6.02	-0.14	-0.04	-1.51	-0.15	-0.04
HU	610400	1.23	-2.62	4.70	-0.21	-0.05	-0.62	0.02	0.00
LT	3646300	-2.14	-4.88	4.82	-0.66	-0.16	-1.18	-0.07	-0.02
LV	1574300	-0.08	-4.26	5.95	-0.23	-0.07	-1.27	-0.16	-0.05
PL	982000	-1.84	-4.24	3.30	-0.11	-0.02	-0.70	-0.06	-0.01
SI	15200000	0.04	-3.28	4.33	-0.32	-0.07	-0.71	0.07	0.02
SK	11100000	-0.72	-3.04	3.59	0.01	0.00	-0.55	-0.62	-0.11
BG	901000	-1.13	-6.22	7.10	0.32	0.11	-2.21	-0.17	-0.06
RO	2206100	-3.27	-3.71	1.52	-0.81	-0.06	-0.28	0.07	0.01

structural effect is positive). Together with the other mixed effects the overall effect on employment in the NMS and CC-2 is negative where mainly the productivity x output effect employment remains almost stable, i.e. the output effect is high enough to counteract the negative productivity and mixed effects.

These results can be compared to the forecasts presented now, which can also be decomposed into these effects. This allows for assessing the quality of the forecasts with respect to the past evidence regarding the productivity and structural changes.

4.3.1 Aggregate employment patterns

The scenarios we present now are calculated from 2002 to 2012. We first present again the implications for total labour demand (this can be compared to section 3 above where a similar analysis was undertaken at the aggregate level) and then discuss the implications for the sectoral employment dynamics. Let us first discuss the aggregate employment patterns which emerge from the scenarios using the multisectoral framework. The absolute numbers of the forecasts as well as differences and an index with an employment level in 2002 equal to 1 is presented in Table 4.8.

Figure 4.4 presents the historical as well as the projected time series for the ten countries with the level of employment in 2002 set equal to 1.[7] One can see that the more successful NMS show a U-shaped pattern whereas the other countries are on a downward trend with respect to employment levels; however, a longer projection period would also show an inverse U-shaped pattern as discussed in chapter 1. In the most advanced NMS, the Czech Republic, Hungary, Slovenia and the Slovak Republic, labour demand is increasing between 4% and 6% over the whole period. For Estonia and Poland we find only small losses in labour demand, which drops only by about 2% relative to the year 2002. More severe losses are expected in Latvia and Lithuania where labour demand drops by about 10%. Finally, Bulgaria and Romania experience severe losses of employment of more than 15% as compared to the year 2002. In absolute levels this means that Romania loses about one million jobs from 2002 to 2007 and half a million jobs from 2007 to 2012; the figures for Bulgaria are -300,000 and -186,000. For the four most advanced countries (Czech Republic, Hungary, Slovenia, Slovak Republic) increases in employment levels can be expected even in the shorter run (i.e. in the period 2002-2007) according to the simulations. Estonia and Poland show losses in employment in the first period but rising levels in the second half of the simulation period.

[7] Data for Lithuania and Romania were adjusted in levels due to breaks in the time series.

Table 4.8

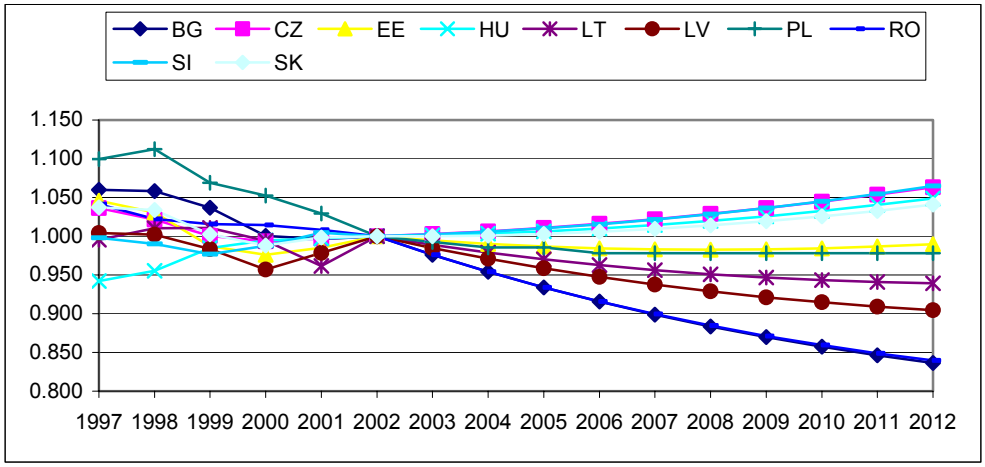
Employment levels and changes

	Employment levels			2002=1		
	2002	**2007**	**2012**	**2002**	**2007**	**2012**
CZ	4761239	4866097	5062730	1.000	1.022	1.063
EE	583649	573741	577712	1.000	0.983	0.990
HU	3870600	3925933	4059697	1.000	1.014	1.049
LT	1406159	1344850	1320687	1.000	0.956	0.939
LV	978070	917015	884820	1.000	0.938	0.905
PL	13779000	13490828	13543344	1.000	0.979	0.983
SI	903034	922433	961779	1.000	1.021	1.065
SK	2127200	2147162	2213811	1.000	1.009	1.041
BG	2978652	2677417	2491106	1.000	0.899	0.836
RO	9234300	8305397	7754066	1.000	0.899	0.840

	Differences in levels		
	2002-2007	**2007-2012**	**2002-2012**
CZ	104858	196633	301491
EE	-9907	3971	-5936
HU	55333	133763	189097
LT	-61309	-24163	-85472
LV	-61055	-32195	-93250
PL	-288172	52517	-235655
SI	19399	39346	58745
SK	19962	66649	86611
BG	-301235	-186311	-487546
RO	-928904	-551330	-1480234

Figure 4.4

Past and future trends in employment levels



These aggregate figures conceal the structural adjustment processes which are underlying the net gains and losses in jobs. Thus we turn next to the structural patterns of the employment dynamics.

4.3.2 Sectoral patterns of employment dynamics

Let us first discuss the results of the sectoral forecasts; then we move to a decompositional analysis of the projections.

4.3.2.1 Overall results

Figure 4.5 shows the evolution of the employment shares for the ten countries where also the historical data from 1997 to 2002 are included. The boxes indicate the employment shares of the EU-15 in 2002. Underlying these graphical representations, Table 4.9 presents the absolute number of the persons employed, the changes in absolute terms between 2002, 2007 and 2012 and the employment relative to the year 2002 for all countries and sectors. Appendix Table A.5 presents the forecasts of value added shares, productivity levels and employment shares (this table also includes a decompositional analysis to which we refer later on).

The decomposition analysis for the scenarios according to equation (4.1) is presented in Table 4.10 for the aggregate effects; the analysis by sector can be found in Appendix Table A.5. As we have again divided the relative changes by the number of years (10) Table 4.10 can be compared to Tables 4.7a and 4.7b above. Compared to the decomposition analysis of the past evidence one can see that the output effect (which is equal across country as we assumed equal GDP growth rates) is higher than the productivity effect (in absolute terms) for all countries. In this way we assumed an optimistic scenario with respect to further GDP growth. Further the productivity x output effect is negative and relatively strong compared to the other mixed effects and on average comparable to the numbers given in Table 4.7. However for some countries differences are quite large. On the other hand the structural effect is quite small for most countries in the forecasts and even positive for some countries (although the magnitudes are quite small). Finally, Table 4.10 shows again a clear distinction between the more advanced transition countries and the countries with lower initial productivity levels and large structural differences compared to the EU-15.

Figure 4.5

Employment demand scenarios by sectors

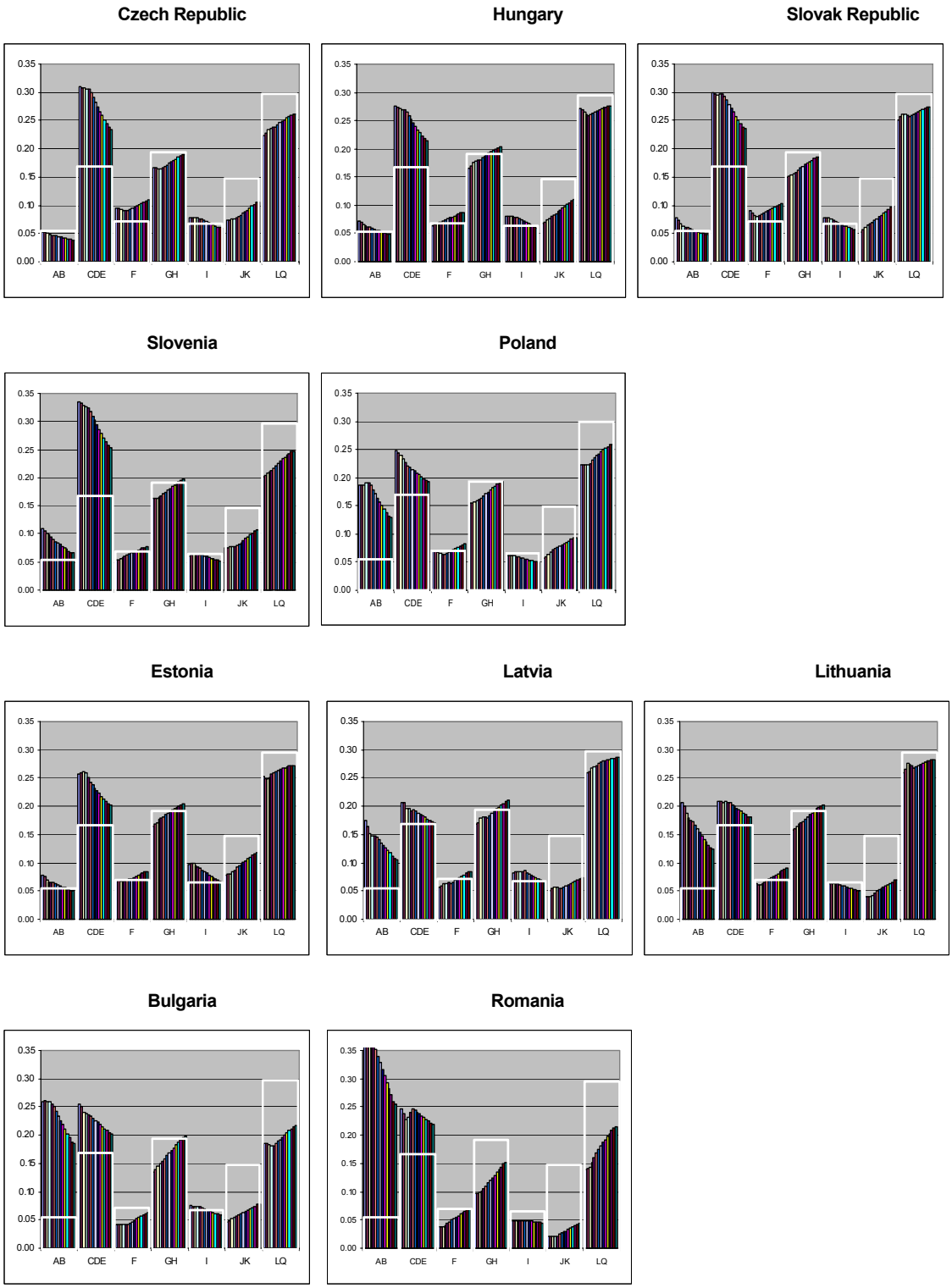


Table 4.9

Sectoral changes in levels

		Number employed			Absolute changes		2002=1	
		2002	2007	2012	2002-2007	2007-2012	2007	2012
CZ	AB	227902	209342	191835	-18560	-17507	0.919	0.842
	CDE	1463112	1296240	1172742	-166872	-123498	0.886	0.802
	F	425203	486715	555630	61512	68915	1.145	1.307
	GH	790307	874695	966583	84388	91888	1.107	1.223
	I	367603	328762	297300	-38841	-31462	0.894	0.809
	JK	364303	446219	546714	81916	100495	1.225	1.501
	LQ	1122809	1224124	1331927	101315	107802	1.090	1.186
EE	AB	38803	33212	28628	-5591	-4585	0.856	0.738
	CDE	144412	127677	115451	-16735	-12226	0.884	0.799
	F	38903	43901	49602	4998	5701	1.128	1.275
	GH	104209	110876	118565	6667	7689	1.064	1.138
	I	54505	45183	38406	-9321	-6777	0.829	0.705
	JK	52204	59623	69025	7419	9401	1.142	1.322
	LQ	150613	153268	158035	2656	4767	1.018	1.049
HU	AB	240900	214126	190766	-26774	-23360	0.889	0.792
	CDE	1048900	941927	863163	-106973	-78764	0.898	0.823
	F	271000	311234	357090	40234	45856	1.148	1.318
	GH	689400	756351	830201	66951	73849	1.097	1.204
	I	309700	271237	241525	-38463	-29713	0.876	0.780
	JK	308100	372853	452712	64753	79860	1.210	1.469
	LQ	1002600	1058205	1124241	55605	66035	1.055	1.121
LT	AB	250610	198817	159658	-51793	-39160	0.793	0.637
	CDE	293312	260746	236692	-32567	-24053	0.889	0.807
	F	93204	105822	120084	12618	14263	1.135	1.288
	GH	239210	253489	269805	14279	16315	1.060	1.128
	I	87404	74876	65498	-12528	-9378	0.857	0.749
	JK	68903	79832	94059	10930	14226	1.159	1.365
	LQ	373516	371267	374891	-2248	3624	0.994	1.004
LV	AB	147010	115695	92254	-31315	-23441	0.787	0.628
	CDE	192014	168049	150464	-23964	-17586	0.875	0.784
	F	60004	67707	76375	7703	8667	1.128	1.273
	GH	172012	178990	187321	6977	8332	1.041	1.089
	I	86006	69787	58124	-16219	-11663	0.811	0.676
	JK	52004	57987	66146	5983	8159	1.115	1.272
	LQ	269019	258799	254136	-10220	-4663	0.962	0.945
PL	AB	2664000	2114421	1699380	-549579	-415041	0.794	0.638
	CDE	3096000	2806928	2591487	-289072	-215441	0.907	0.837
	F	851000	982503	1132144	131503	149642	1.155	1.330
	GH	2207000	2406592	2627313	199592	220721	1.090	1.190
	I	832000	737893	664846	-94107	-73047	0.887	0.799
	JK	989000	1119506	1293385	130506	173879	1.132	1.308
	LQ	3140000	3322986	3534789	182986	211804	1.058	1.126
SI	AB	84003	71928	61968	-12075	-9960	0.856	0.738
	CDE	295011	263801	240736	-31211	-23064	0.894	0.816
	F	54502	63858	74596	9356	10738	1.172	1.369
	GH	151506	170127	190539	18621	20412	1.123	1.258
	I	58002	53528	49833	-4475	-3694	0.923	0.859
	JK	68003	84224	104332	16222	20108	1.239	1.534
	LQ	192007	214967	239774	22959	24808	1.120	1.249
SK	AB	131400	116649	103866	-14751	-12782	0.888	0.790
	CDE	640900	568046	514702	-72854	-53343	0.886	0.803
	F	176000	200633	228686	24633	28053	1.140	1.299
	GH	340000	375185	414362	35185	39178	1.103	1.219
	I	154400	137610	124365	-16790	-13245	0.891	0.805
	JK	143100	177504	220101	34404	42597	1.240	1.538
	LQ	541400	571535	607727	30135	36192	1.056	1.123
BG	AB	769117	585130	450871	-183988	-134258	0.761	0.586
	CDE	708278	586092	499147	-122186	-86945	0.827	0.705
	F	121005	138640	158379	17635	19739	1.146	1.309
	GH	457729	476240	497197	18511	20957	1.040	1.086
	I	217380	173637	142702	-43743	-30935	0.799	0.656
	JK	167852	180340	199138	12488	18798	1.074	1.186
	LQ	537291	537339	543671	48	6332	1.000	1.012
RO	AB	3361500	2534087	1934294	-827413	-599793	0.754	0.575
	CDE	2310700	1951028	1690275	-359672	-260753	0.844	0.731
	F	412800	478886	552640	66086	73754	1.160	1.339
	GH	971300	1076869	1188689	105569	111821	1.109	1.224
	I	457700	395070	347060	-62630	-48010	0.863	0.758
	JK	210700	271381	348091	60681	76710	1.288	1.652
	LQ	1509600	1598076	1693017	88476	94941	1.059	1.122

Table 4.10

Decomposition analysis (absolute changes 2002-2012 and changes relative to employment level 2002 per year in per cent)

	Total change in employment	Productivity effect	Output effect	Structural effect	Structure output effect	Productivity output effect	Productivity structure effect	Mixed effect
CZ	302706	-1508486	2350846	189552	93229	-741924	-53949	-26534
	0.63	-3.16	4.92	0.40	0.20	-1.55	-0.11	-0.06
HU	189058	-1180868	1903639	14848	7302	-580769	16676	8202
	0.49	-3.05	4.92	0.04	0.02	-1.50	0.04	0.02
SK	86571	-651939	1046186	-3485	-1714	-320626	12146	5973
	0.41	-3.06	4.92	-0.02	-0.01	-1.51	0.06	0.03
SI	51619	-227352	389831	-7500	-3689	-111834	8182	4025
	0.65	-2.87	4.92	-0.09	-0.05	-1.41	0.10	0.05
EE	-4310	-146914	210130	3621	1781	-72268	-427	-210
	-0.10	-3.44	4.92	0.08	0.04	-1.69	-0.01	0.00
PL	-235702	-4717035	6776850	-78906	-38807	-2319943	95264	46853
	-0.17	-3.42	4.92	-0.06	-0.03	-1.68	0.07	0.03
LT	-93309	-567897	755551	-11268	-5543	-279330	10201	5018
	-0.61	-3.70	4.92	-0.07	-0.04	-1.82	0.07	0.03
LV	-110334	-465831	569641	10850	5337	-229140	-766	-377
	-0.95	-4.02	4.92	0.09	0.05	-1.98	-0.01	0.00
BG	-487457	-1330587	1465016	8191	4029	-654454	13672	6725
	-1.64	-4.47	4.92	0.03	0.01	-2.20	0.05	0.02
RO	-1480294	-3974624	4541592	-293920	-144554	-1954790	231909	114056
	-1.60	-4.30	4.92	-0.32	-0.16	-2.12	0.25	0.12

4.3.2.2 Country-specific description of results

Let us now discuss each country in turn. We start with the four most successful and advanced NMS (Czech Republic, Hungary, Slovenia and Slovak Republic).

Czech Republic

The model predicts that the largest shake-out of labour in absolute terms occurs in the manufacturing sectors where in the first period more than 160,000 jobs and in the second period more than 120,000 jobs will be lost. This amounts to a loss of about 20% of jobs in the manufacturing sector (relative to 2002). A similar loss in relative terms occurs in the Transport sector (I), although the absolute numbers are smaller due to the smaller number of employed persons in this sector. Over the whole period about 70,000 jobs will be lost in this sector. Additionally, about 35,000 employees are dismissed in agriculture, which thus loses about 15% of the employed persons in 2002. All other sectors are creating employment: in absolute terms the by far largest job creator is the Public Services sector (LQ) in which employment increases of about 100,000 in each of the two subperiods are expected; this is followed by the Business Services sector (JK) which creates 80,000 jobs in the first and more than 100,000 jobs in the second subperiod. This sector is closely followed by Trade, Restaurants and Repair with slightly lower absolute numbers of job creation. Finally, in the Construction sector (F) 60,000 to 70,000 jobs are expected to be created in the two subperiods. In relative terms the Business Services sector (JK) is the most important with an increase in jobs of about 50% over the whole period. This is followed by Construction (F) with more than 30%, Trade, Repair and Restaurants (GH) with more than 20% and finally Public Services (LQ) with slightly less than 20%.

Figure 4.6 shows the dynamics of the employment patterns also compared to the EU-15 (shaded boxes). One can see that the Czech Republic will have a higher employment share in the manufacturing sector (CDE) also in the medium run (about 24% as compared to 17% in the EU-15) though the share is dramatically falling from more than 30%. The share is also higher in Construction (F) by about 5 percentage points and even rising. A much lower share can be observed in Business Services (JK) and Public Services (LQ) where in 2012 the shares are about 5 percentage points below the EU average despite the increases in employment in these sectors. Convergence to the EU shares can be observed in Trade, Repair and Restaurants (GH) and Transport (I), whereas in Agriculture (AB) the share tends towards a lower level than the EU average.

What are the main driving forces behind these shifts? The shift-share analysis indicates that at the economy level about 300,000 jobs will be created over the period 2002-2012. This net increase results from a loss of employment due to productivity increases of more than 1.5 million persons, GDP growth accounts for the creation of more than 2.3 million jobs, whereas about 200,000 jobs are ‘created’ by shifts in the structure of the economy

(towards more labour-intensive sectors). Also the mixed terms, in particular the term which accounts for changes in productivity and changes in output are of considerable size. The lower part of the table shows the changes relative to total employment demand in 2002. In all sectors the most important items behind the changes are employment losses due to productivity growth and employment gains due to total GDP growth. Changes in the sectoral composition of the economy play a minor role in most cases with the exception of Public Services (LQ).

Hungary

Hungary shows a similar overall dynamic pattern as the Czech Republic, however, starting from different levels. The main differences are that the Manufacturing sector (CDE) starts with lower shares and also has a lower employment share at the end of the period. Construction (F) and Trade, Repair and Restaurants (GH) have slightly higher shares. Finally, Public Services (LQ) shows a somewhat higher share than in the Czech Republic, but still below the EU-15 level; similarly, the share in Business Services (JK) is about 5 percentage points below the EU-15 in 2012.

In absolute terms the largest shake-out of labour occurs in Manufacturing (CDE) where more than 185,000 jobs will be lost over the period 2002-2012. Employment losses are also expected in the Transport sector (I) with a loss of about 70,000 jobs and in Agriculture with a loss of about 50,000 jobs. All other sectors are creating jobs, the most important in absolute terms being Trade, Hotels and Repair (GH) and Business Services (JK) with about 140,000 jobs each. A slightly lower magnitude is expected for the Public Services sector (LQ), creating about 120,000 jobs; less important in absolute terms is Construction (F) with a rise in labour demand for about 95,000 jobs. In relative terms the most important employment-creating sector is Business Services (JK), followed by Construction (F) and Hotels (GH). The least important employment-creating sectors is Public Services (LQ). For the employment-shedding sectors it turns out that all of them lose about 20% of employment as compared to 2002.

The most important factor for lower employment demand is again productivity growth, which accounts for more than one million losses in employment over the whole period. This is more than compensated by employment growth due to GDP growth, which creates about two million jobs. Structural shifts only account for an increase of about 15,000 jobs in the economy. These shifts account even less for employment growth than in the Czech Republic, which partly explains the lower job creation in Hungary.

Slovak Republic

The Slovak Republic shows again a similar pattern as the two countries already considered. In Manufacturing (CDE) about 120,000 jobs are lost over the period and

slightly less than 30,000 jobs are lost in Agriculture (AB) and Transport (I), respectively. The other sectors are creating jobs, the most important sector in absolute terms being Trade, Hotels and Restaurants (GH) and Business Services (JK): in each of these sectors labour demand increases by about 75,000 jobs. The remaining two sectors are also important, with a higher labour demand of about 66,000 jobs in Public Services (LQ) and about 50,000 jobs in Construction (F). In relative terms, Business Services (JK) is the most important job-creating sector, with labour demand increasing by 50%, followed by Construction (F) with 30% and Trade, Restaurants and Hotels (GH) with 20% from 2002 to 2012. The labour-shedding sectors are very similar in relative terms as each of them loses about 20% of jobs over the simulation period.

More than 600,000 jobs are lost due to productivity growth but more than one million jobs are created by GDP growth (which is assumed to be 4% p.a.). The change in the structure of the economy has a slightly negative effect on total employment changes.

Slovenia

Among these four most successful countries Slovenia starts with a relatively high share of employment in agriculture (about 10% in 2002) which decreases to the EU-15 level over the period. Also the employment share of almost 35% in manufacturing is relatively high compared to the other countries already discussed. Given these facts the shares of employment are lower in Construction (F) and mainly in Public Services (GH) when compared to the other countries. In relative terms the employment losses in agriculture are higher than in the other countries (about 30% of the level in 2002), whereas losses in Manufacturing (CDE) with about 20% are similar to other countries; employment destruction in Transport (I) is even lower with about 15%. On the other hand, job creation in Public Services (LQ) with an increase of more than 25% is much higher whereas the increase of jobs in Business Services (JK) with about 50% is similar to that in the countries described above. Employment creation in relative terms is also somewhat higher in Construction (F) and Hotels and Restaurants (GH). In absolute terms the most important labour-shedding sectors are Manufacturing with -50,000 jobs and Agriculture (AB) with -20,000 jobs. The most important employment-creating sectors are Public Services (LQ) with more than 40,000 jobs, Hotels and Restaurants (GH) with 35,000 jobs and Business Services (JK) with more than 30,000 jobs. The least important sector is Construction (F) with less than 20,000 jobs.

Productivity growth is again the most important reason for job losses, although slightly less important than in the other countries, which reflects the fact that Slovenia is already closer to the EU-15 productivity levels on average. Structural change has a slightly higher effect on aggregate employment levels as compared to the other countries, which mainly reflects the employment losses in Agriculture (AB) for which employment shares drop from 10% to

5%. Still, the effect of structural change is negligible as compared to the other components of the shift-share analysis.

Let us now turn to the group of countries which should experience a decline in employment levels according to the simulations. These are Poland and the three Baltic countries, Estonia, Latvia and Lithuania.

Estonia

Let us start with Estonia as the structure of this country in 2002 is similar to the ones discussed before. At the end of the simulation period the employment share in Manufacturing (CDE) is relatively low with 20%; the shares in Public Services (LQ) and Business Services (JK) become high as compared to the other countries. Labour-shedding is highest in Manufacturing (CDE) with a loss of 20,000 jobs, followed by Transport (I) in which employment is reduced by 11,000 and Agriculture (AB) with a reduction of about 7500 jobs. The most important job-creating sectors are Business Services (JK) and Hotels and Restaurants (GH) where labour demand is rising by more than 10,000 jobs. Labour demand in Construction (F) will increase by about 7000 jobs and the least important sector in absolute terms is Public Services (LQ) where an increase of about 5500 is expected.

In relative terms the fall in employment in the labour-shedding sectors is higher than in the countries discussed before and is less than between 25% and 30% of the level in 2002. On the other hand, job creation is lower than in the other countries and is 30% above the level in 2002 in Business Services (JK), 27% in Construction (F), 13% in Trade, Hotels and Restaurants (GH) and only 5% in Public Services (LQ). This reflects the fact that productivity catching-up is even more important as the initial productivity gap is higher on average.

The decomposition analysis shows that the productivity effect is larger than in the other countries discussed so far. The effects of changes in shares are rather small but positive. However, the total effect on employment demand remains negative.

The following countries are different in so far as they start with a relatively high share of employment in agriculture and thus follow a somewhat different pattern than the countries before.

Poland

Poland starts off with a share of employment in Agriculture (AB) of slightly less than 20%, an employment share of 25% in Manufacturing (CDE) and slightly lower employment shares in Public Services (LQ) with about 22 %. The scenarios show that in 2012 the share in Agriculture (AB) is still at a level of about 13%, has declined in Manufacturing to 19%

and has risen mainly in Trade, Hotels and Restaurants (GH), Business Services (JK) and Public Services (LQ).

In relative terms job destruction is highest in Agriculture (AB) where labour demand is more than 35% below the level of 2002. In the other two sectors with job destruction the relative decreases are similar as in the other countries: 17% in Manufacturing (AB) and 20% in Transport (I). In absolute terms this implies that one million jobs are lost in Agriculture (AB), more than half a million in Manufacturing (CDE) and an additional 170,000 jobs are lost in Transport (I). This decline in labour demand is not compensated by increases in other sectors in the first period; the net effect on employment is however positive in the second period. Here the most important sectors in absolute terms are Trade, Hotels and Restaurants (GH) and Public Services (LQ) with an increase of more than 400,000 jobs each. About 300,000 jobs are to be created in Business Services (JK) and Construction (F).

The by far most important source of job losses are again increases in productivity levels, which account for a loss in demand of almost five million jobs. Total GDP growth contributes however more than 6.7 million jobs, whereas the total effect of a change in the structure accounts for a loss of about 80,000 jobs. Still, the interaction term is rather low (-2.1 million) so that the net effect becomes negative.

Latvia and Lithuania

These two countries start off from rather similar positions. The main difference is that Lithuania has a higher share of employment in Agriculture (AB) – 21%, as against 17% in Latvia – but lower shares mainly in Transport (I) and Business Services (JK). The decrease in labour demand is highest in Agriculture (AB) in relative terms (about 35% will be lost) and also in absolute terms (-100,000 in Lithuania and -65,000 in Latvia). The second most important sector in absolute terms is Manufacturing with -60,000 in Lithuania and -45,000 in Latvia. More important in relative terms but less so in absolute terms is Transport with a decrease of about 25,000 jobs in Lithuania and about 30,000 in Latvia. In Public Services (LQ) Latvia will additionally lose 17,000 jobs, whereas employment in this sector in Lithuania remains more or less stable. For the other sectors there are only slight differences in relative terms. With respect to the main causes of the employment decline the same as for Poland can be said and shall not be repeated here.

Let us next turn to the countries which – according to the scenarios – shall experience the most severe losses in employment, namely Bulgaria and Romania.

Bulgaria

Bulgaria starts off with almost equal shares of employment in Agriculture (AB) and Manufacturing (CDE) but relatively low shares in Public Services (LQ). Relative to the other

countries, also the share in Trade, Hotels and Restaurants (GH) is low with 13%. In absolute terms the by far most important sector with regard to losses in employment is Agriculture (AB) where more than 300,000 jobs will be lost over the period. This is followed by Manufacturing (CDE) where a loss of about 200,000 jobs is expected, and Transport (I) with -70,000. In absolute terms the creation of jobs is rather small: the most important sectors are Construction (F) and Trade, Hotels and Restaurants (GH) with less than 40,000 jobs created, Business Services (JK) with about 30,000 and finally Public Services (LQ) with only 6500.

In relative terms this means that employment drops by more than 40% in Agriculture (AB), about 30% in Transport (I) and 30% in Manufacturing (CDE). The most important gains in jobs in relative terms are in Construction (F) with about 30% and in Business Services (JK) with close to 20%. In Trade, Hotels and Restaurants (GH) the number of employees will rise by 8%, and it will remain almost stable in Public Services (LQ).

The effect of increases in productivity on employment is much stronger than in the other countries, and in absolute terms it is only slightly lower than the positive effect of total GDP growth. Again, the total effect of structural change is rather small.

Romania

Finally, the country with the highest share of employment in Agriculture (AB) – about 40% – is Romania. Correspondingly, the shares in all other sectors are much smaller. The dynamic pattern exhibits dramatic changes in employment structures: the share of employment drops from 40% to 25% in Agriculture (AB) and rises from 10% to 15% in Trade, Hotels and Restaurants (GH) and from less than 15% to more than 20% in Public Services (GH). In the other sectors changes are less dramatic. The share of employment in Business Services (JK) is very small with about 3%, and it remains below 5% at the end of the simulation period.

According to this scenario employment decreases in Agriculture (AB) to about 57% of the initial level, in Manufacturing (CDE) to about 73% and in Transport to 75%. In absolute terms this means that almost 1.5 million employees will lose their jobs in Agriculture (AB), almost 700,000 in Manufacturing (CDE) and 100,000 in Transport (I). Although relative increases in employment are sometimes high (e.g. 65% in Business Services (JK) and 30% in Construction (F)), in absolute terms the increases are quite small as the employment shares are rather small in these sectors. The most important job-creating sectors are Trade, Hotels and Restaurants (GH) with an increase of about 215,000 jobs and Public Services (LQ) with about 180,000 jobs. Further, employment demand will rise in Construction (F) and Business Services (JK) by about 130,000 jobs in each sector. Again the effect of productivity increases has the largest negative impact on employment demand. In this case – similarly to Bulgaria – the effect of total GDP growth is only slightly

higher in absolute terms. Additionally, the effect of structural change is negative and stronger than in the other countries, although it is small relative to the other terms.

5 Changes in demand for occupations and educations

In a next step we use the breakdown of the LFS data by occupations (BCLS, BCHS, WCLS, WCMS, WCHS) and educational attainment levels (LE, ME, and HE) and analyse the dynamics of employment patterns by these occupational and educational categories. For the classifications used for these categories see Appendix Tables A.3 and A.4. At the aggregate level changes in the occupational structure may result from (i) changes in the sectoral structure of the economy (at constant occupational shares within sectors) and (ii) changes of the occupational structures within sectors. Changes in the educational structure of employees may additionally result from (iii) changes of the educational structures within occupations by sector. Before presenting the scenarios we first discuss the structure of occupations compared to the EU-15 average and analyse the changes over time by shift-share analyses. For a detailed study on the structure of employment in the NMS and CC-2 by these categories see Landesmann et al. (2005) where an even more detailed classification of the medium-educated employees (ME) is used.

5.1 Labour demand by occupations and educational attainment levels

5.1.1 Occupations

Table 5.1 presents the occupational structures of the NMS and CC-2 and the (weighted) mean of the EU-15. Table 5.1a shows the occupational structure within sectors (i.e. the 'job intensity' of the sectors), whereas Table 5.1b provides information on the distribution of occupations across sectors. Whereas the first measure is mainly determined by technological and institutional requirements, the latter also depends on the sectoral employment structure of the economy under consideration. In Figure 5.1 we show the differences of the NMS and CC-2 from the EU-15 means of the occupational structure by sector derived from Table 5.1a.

Let us first discuss the occupational structure within sectors and for comparisons the deviations from EU-15 means which are graphically presented in Figure 5.1. For the EU-15 Agriculture (AB) quite intensively uses BCLS jobs, whereas in Industry (CDE) and Construction (F) BLHS jobs are dominant (see Table 5.1a for these numbers). In Industry (CDE) also the WCHS have a relatively large share. In Trade, Repairs and Hotels (GH) the WCLS and WCHS jobs have the largest shares; this is similar in Public Services (LQ) where, however, the WCHS jobs are dominant with more than 50%. In Transport (I) BCHS,

Table 5.1a

Occupational structures by sector, 2002

		AB	CDE	F	GH	I	JK	LQ
CZ	**BCLS**	0.46	0.05	0.03	0.04	0.05	0.06	0.11
	BCHS	0.28	0.65	0.69	0.11	0.47	0.05	0.05
	WCLS	0.02	0.01	0.00	0.48	0.05	0.03	0.15
	WCMS	0.04	0.06	0.03	0.08	0.19	0.16	0.09
	WCHS	0.19	0.23	0.24	0.28	0.24	0.70	0.60
EE	**BCLS**	0.70	0.14	0.07	0.05	0.08	0.19	0.11
	BCHS	0.14	0.63	0.82	0.13	0.37	0.12	0.05
	WCLS	0.01	0.00	0.00	0.42	0.05	0.06	0.14
	WCMS	0.00	0.03	0.01	0.04	0.21	0.06	0.02
	WCHS	0.14	0.20	0.10	0.37	0.29	0.57	0.67
HU	**BCLS**	0.62	0.06	0.09	0.05	0.05	0.09	0.14
	BCHS	0.21	0.68	0.72	0.14	0.50	0.05	0.06
	WCLS	0.01	0.01	0.01	0.50	0.03	0.10	0.14
	WCMS	0.06	0.07	0.04	0.10	0.22	0.17	0.08
	WCHS	0.11	0.18	0.14	0.20	0.20	0.59	0.59
LT	**BCLS**	0.92	0.10	0.15	0.07	0.06	0.05	0.15
	BCHS	0.05	0.66	0.70	0.15	0.51	0.12	0.05
	WCLS	0.00	0.02	0.01	0.40	0.04	0.08	0.16
	WCMS	0.01	0.03	0.00	0.06	0.13	0.10	0.04
	WCHS	0.02	0.19	0.14	0.32	0.26	0.66	0.61
LV	**BCLS**	0.69	0.16	0.13	0.08	0.09	0.14	0.13
	BCHS	0.18	0.56	0.60	0.08	0.44	0.07	0.07
	WCLS	0.02	0.01	0.01	0.43	0.07	0.08	0.15
	WCMS	0.01	0.03	0.02	0.08	0.09	0.07	0.05
	WCHS	0.11	0.24	0.24	0.33	0.31	0.64	0.60
PL	**BCLS**	0.95	0.09	0.11	0.05	0.03	0.10	0.12
	BCHS	0.02	0.61	0.65	0.11	0.55	0.06	0.06
	WCLS	0.00	0.01	0.00	0.50	0.03	0.12	0.09
	WCMS	0.00	0.07	0.03	0.10	0.18	0.17	0.10
	WCHS	0.03	0.23	0.21	0.24	0.21	0.54	0.63
SI	**BCLS**	0.93	0.04	0.06	0.04	0.03	0.07	0.08
	BCHS	0.02	0.61	0.64	0.11	0.43	0.03	0.04
	WCLS	0.01	0.02	0.01	0.48	0.02	0.09	0.13
	WCMS	0.01	0.08	0.05	0.12	0.27	0.21	0.10
	WCHS	0.03	0.25	0.23	0.25	0.26	0.60	0.65
SK	**BCLS**	0.44	0.06	0.15	0.04	0.06	0.06	0.12
	BCHS	0.36	0.67	0.65	0.12	0.48	0.06	0.06
	WCLS	0.01	0.01	0.00	0.55	0.03	0.07	0.15
	WCMS	0.03	0.04	0.02	0.07	0.18	0.13	0.06
	WCHS	0.16	0.21	0.18	0.22	0.25	0.68	0.60
BG	**BCLS**	0.78	0.10	0.12	0.08	0.07	0.07	0.11
	BCHS	0.12	0.63	0.61	0.10	0.49	0.05	0.06
	WCLS	0.01	0.02	0.01	0.49	0.07	0.15	0.09
	WCMS	0.02	0.05	0.03	0.08	0.13	0.12	0.08
	WCHS	0.07	0.19	0.23	0.24	0.24	0.61	0.66
RO	**BCLS**	0.96	0.07	0.15	0.07	0.07	0.11	0.10
	BCHS	0.02	0.72	0.62	0.11	0.56	0.07	0.15
	WCLS	0.00	0.01	0.00	0.52	0.01	0.10	0.12
	WCMS	0.00	0.04	0.03	0.07	0.17	0.13	0.06
	WCHS	0.01	0.16	0.19	0.23	0.19	0.58	0.57
EU-15	**BCLS**	0.85	0.07	0.09	0.09	0.09	0.12	0.11
	BCHS	0.04	0.54	0.69	0.13	0.38	0.04	0.04
	WCLS	0.01	0.02	0.00	0.38	0.04	0.02	0.20
	WCMS	0.02	0.10	0.06	0.11	0.25	0.24	0.12
	WCHS	0.09	0.27	0.16	0.28	0.24	0.57	0.53

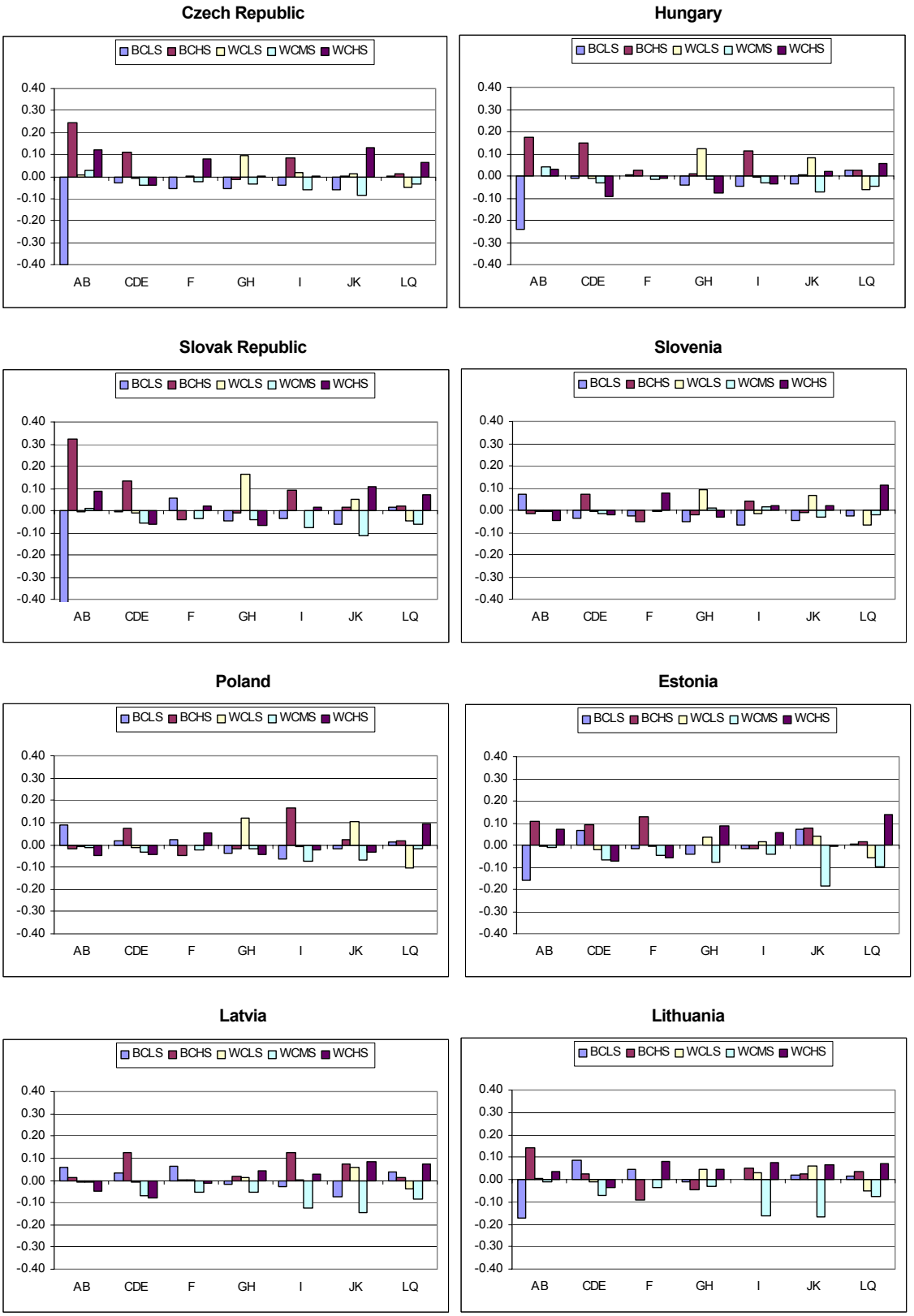
Table 5.1b

Sectoral distribution of occupations, 2002

		AB	CDE	F	GH	I	JK	LQ
CZ	**BCLS**	0.28	0.18	0.04	0.08	0.05	0.06	0.31
	BCHS	0.04	0.58	0.18	0.05	0.11	0.01	0.03
	WCLS	0.01	0.03	0.00	0.64	0.03	0.02	0.27
	WCMS	0.03	0.23	0.03	0.16	0.17	0.14	0.23
	WCHS	0.03	0.20	0.06	0.13	0.05	0.15	0.38
EE	**BCLS**	0.31	0.23	0.03	0.06	0.05	0.12	0.19
	BCHS	0.03	0.52	0.16	0.08	0.12	0.04	0.04
	WCLS	0.00	0.01	0.00	0.62	0.04	0.05	0.28
	WCMS	0.01	0.16	0.01	0.14	0.44	0.12	0.12
	WCHS	0.02	0.13	0.02	0.18	0.08	0.14	0.43
HU	**BCLS**	0.33	0.14	0.06	0.08	0.04	0.06	0.29
	BCHS	0.04	0.56	0.15	0.08	0.12	0.01	0.05
	WCLS	0.00	0.02	0.00	0.66	0.02	0.06	0.24
	WCMS	0.04	0.20	0.03	0.20	0.19	0.15	0.20
	WCHS	0.02	0.16	0.03	0.12	0.05	0.15	0.47
LT	**BCLS**	0.66	0.08	0.04	0.05	0.01	0.01	0.15
	BCHS	0.03	0.50	0.19	0.09	0.12	0.02	0.05
	WCLS	0.00	0.03	0.00	0.56	0.02	0.03	0.35
	WCMS	0.03	0.15	0.01	0.26	0.19	0.12	0.24
	WCHS	0.01	0.12	0.03	0.17	0.05	0.10	0.51
LV	**BCLS**	0.50	0.15	0.04	0.07	0.04	0.04	0.17
	BCHS	0.11	0.44	0.15	0.06	0.15	0.01	0.08
	WCLS	0.02	0.02	0.00	0.56	0.04	0.03	0.33
	WCMS	0.02	0.12	0.03	0.29	0.16	0.08	0.29
	WCHS	0.04	0.13	0.04	0.15	0.07	0.09	0.48
PL	**BCLS**	0.72	0.08	0.02	0.03	0.01	0.03	0.11
	BCHS	0.02	0.55	0.15	0.07	0.14	0.02	0.05
	WCLS	0.00	0.02	0.00	0.71	0.01	0.08	0.18
	WCMS	0.01	0.19	0.02	0.20	0.14	0.15	0.29
	WCHS	0.02	0.17	0.04	0.13	0.04	0.13	0.47
SI	**BCLS**	0.66	0.09	0.03	0.05	0.01	0.04	0.12
	BCHS	0.01	0.68	0.13	0.06	0.09	0.01	0.03
	WCLS	0.01	0.05	0.00	0.66	0.01	0.05	0.22
	WCMS	0.01	0.26	0.03	0.20	0.15	0.15	0.20
	WCHS	0.01	0.24	0.04	0.13	0.05	0.13	0.40
SK	**BCLS**	0.27	0.18	0.11	0.06	0.04	0.04	0.29
	BCHS	0.07	0.57	0.15	0.05	0.10	0.01	0.04
	WCLS	0.00	0.03	0.00	0.64	0.02	0.03	0.28
	WCMS	0.03	0.20	0.03	0.18	0.20	0.13	0.23
	WCHS	0.03	0.19	0.04	0.10	0.05	0.13	0.45
BG	**BCLS**	0.49	0.17	0.04	0.10	0.03	0.02	0.15
	BCHS	0.04	0.59	0.11	0.07	0.13	0.01	0.05
	WCLS	0.01	0.05	0.00	0.70	0.04	0.05	0.15
	WCMS	0.03	0.20	0.02	0.24	0.15	0.09	0.26
	WCHS	0.02	0.17	0.04	0.15	0.06	0.10	0.47
RO	**BCLS**	0.87	0.04	0.02	0.02	0.01	0.01	0.04
	BCHS	0.03	0.65	0.10	0.04	0.10	0.01	0.08
	WCLS	0.00	0.02	0.00	0.69	0.01	0.03	0.24
	WCMS	0.02	0.24	0.03	0.17	0.21	0.08	0.25
	WCHS	0.03	0.21	0.04	0.12	0.05	0.07	0.47
EU-15	**BCLS**	0.27	0.11	0.05	0.14	0.05	0.12	0.25
	BCHS	0.01	0.47	0.24	0.11	0.10	0.02	0.05
	WCLS	0.00	0.03	0.00	0.51	0.02	0.02	0.42
	WCMS	0.01	0.16	0.04	0.17	0.12	0.24	0.28
	WCHS	0.01	0.15	0.03	0.14	0.04	0.20	0.43

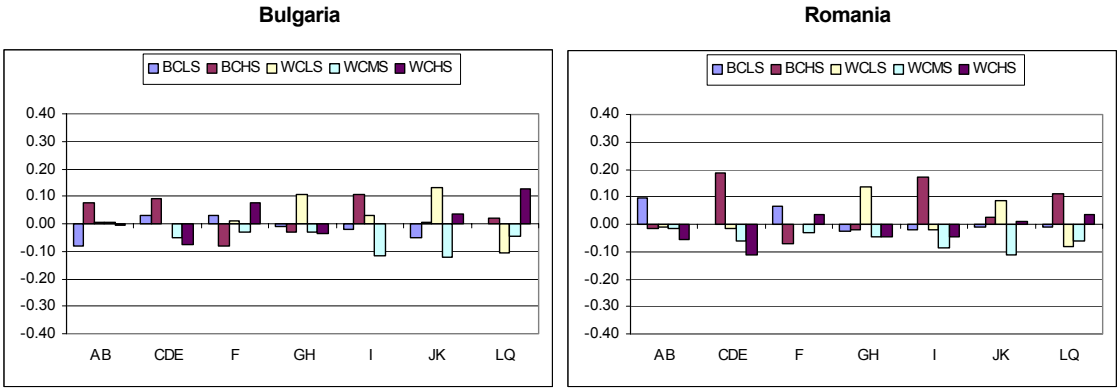
Figure 5.1

Occupational shares by sectors, 2002 (differences from EU-15 means)



(Figure 5.1 contd.)

Figure 5.1 (continued)



WCMS and WCHS are the most important groups. Finally, in Business Services (JK) the WCMS and WCHS jobs show the highest shares with the latter accounting for more than 50%.

As can be seen from Figure 5.1, in most countries the structure of occupations for each sector deviates less than 15 percentage points from the EU-15 means described above. The most important exception is Agriculture (AB) where in particular the Czech Republic, Hungary and the Slovak Republic have a much lower share of BCLS jobs and much more BCHS jobs.

For an interpretation of the scenarios presented below, it is not only the 'job intensity' of each sector that is important but also how specific occupations are distributed over sectors as demand for each particular occupation also depends on the structure of the economy, which changes over time as was argued in section 4. This information is provided in Table 5.1b. Let us again look first at the EU-15 means. One can see that employees in BCLS jobs are mainly employed in Agriculture (AB) and Public Services (LQ). Industry (CDE) has the highest share of employees in BCHS jobs, with Construction (F) being next. The WCLS jobs are mainly found in Trade, Repair and Hotels (GH) and Public Services (LQ) whereas employees in WCMS jobs are more equally distributed across sectors. The most important sectors for this group are Business and Public Services (JK and LQ). Finally, the most important sector for WCHS is Public Services (LQ) where 43% are employed. For this group also Industry (CDE), Trade, Repair and Hotels (GH) and Business Services (JK) are important. Differences of the NMS and CC-2 from the EU-15 now reflect also the employment structure by sectors, although qualitatively similar patterns with respect to the distribution of jobs across sectors can be found. The most important differences arise from the high share of employment in Agriculture in some countries. We shall not go further into detail here.

What causes the shifts in demand by occupations? As we did before, we can decompose the total change in the following way. Since we do not want to go into the details of the effects of productivity changes, sectoral output changes and overall GDP growth (which would require to measure productivity by occupation) we start with the equation $L_{io} = L\gamma_i\gamma_{io}$ where L_{io} denotes labour demand by sector and occupation, L denotes total labour demand, γ_i is the share of employment in sector *i*, and γ_{io} is the share of occupational group *o* in total employed of sector *i*. All of these variables represent the initial year of the analysis. A Δ denotes the change of the respective variable over the period under consideration. Decomposition of this equation yields

$$\Delta L_{io} = \underbrace{\Delta L\gamma_i\gamma_{io}}_{(1)} + \underbrace{L\Delta\gamma_i\gamma_{io}}_{(2)} + \underbrace{L\gamma_i\Delta\gamma_{io}}_{(3)} + \Delta L\Delta\gamma_i\gamma_{io} + \Delta L\gamma_i\Delta\gamma_{io} + L\Delta\gamma_i\Delta\gamma_{io} + \Delta L\Delta\gamma_i\Delta\gamma_{io} \quad (5.1)$$

The first term is the overall effect of changes in overall employment levels, the second term reflects the impact of a change in the sectoral employment structure whereas the third term measures the effect of a change of the occupational structure within the sectors. The other terms are mixed effects. Summarizing over sectors gives the impact on employment by occupational categories.[8] The decomposition analysis is presented in Table 5.2 for the period 1998-2002 (2000-2002 for Poland and Bulgaria) where only the first three terms are reported as the mixed terms are very small. The numbers are again expressed relative to total employment in the initial year and divided by the number of years.

The first two columns present the share of this occupational group in total employment in the initial year 1998 (2000 for Poland and Bulgaria) and the last year 2002. The third column shows the change of demand relative to total employment in 1998 per year (i.e. change of employment of the particular occupational category divided by the number of total employed [all occupational categories] in the initial year and again divided by the number of years). One can see that demand for BCLS, BCHS and WCMS is declining in most cases although magnitudes are quite different across countries. In the decomposition analysis the first term reflects changes in total employment levels and is positive for countries showing positive employment growth, and negative otherwise. The magnitudes depend on the sectoral structure as well as occupational structures within sectors discussed above. More important are the second and third terms (see columns [2] and [3] in Table 5.2). The second term shows the effects of changes in the employment structure on occupational demand. One can see that this term is negative in most cases for BCLS and BCHS workers; exceptions are Poland for BCLS and Slovenia and Romania for BCHS. For the other occupations the effect of structural change is always positive. The third term shows the effect of changes in the occupational structure within sectors. For this term the evidence is rather mixed and no clear pattern can be observed from this analysis.

[8] Detailed results by industry can be requested from the author.

With respect to the magnitudes of these two effects again no clear pattern emerges. The other mixed effects are negligible as these are rather small and are not reported.

Table 5.2

Decomposition analysis of occupational structures, 1998-2002

		Shares		Decomposition			
		Initial year	2002	Change in demand	(1)	(2)	(3)
CZ	**BCLS**	10.82	8.08	-0.73	-0.06	-0.05	-0.65
	BCHS	34.09	35.02	0.05	-0.18	-0.23	0.48
	WCLS	12.46	12.58	-0.04	-0.07	0.04	-0.02
	WCMS	8.13	8.49	0.04	-0.04	0.03	0.06
	WCHS	34.50	35.84	0.15	-0.18	0.21	0.14
EE	**BCLS**	16.08	14.78	-0.49	-0.18	-0.35	0.07
	BCHS	29.69	30.05	-0.25	-0.34	-0.31	0.40
	WCLS	11.14	12.35	0.18	-0.13	0.23	0.07
	WCMS	4.48	4.71	0.00	-0.05	0.08	-0.01
	WCHS	38.60	38.11	-0.55	-0.44	0.35	-0.51
HU	**BCLS**	25.99	20.97	-1.25	0.00	-0.61	-0.70
	BCHS	25.75	24.87	-0.22	0.00	-0.13	0.01
	WCLS	11.93	13.03	0.28	0.00	0.16	0.08
	WCMS	5.22	4.70	-0.13	0.00	0.04	-0.19
	WCHS	31.11	36.43	1.34	0.00	0.54	0.79
LT	**BCLS**	25.29	26.18	0.03	-0.19	-0.20	0.45
	BCHS	29.16	26.70	-0.81	-0.22	-0.32	-0.28
	WCLS	8.57	11.73	0.70	-0.06	0.20	0.55
	WCMS	5.69	3.93	-0.47	-0.04	0.03	-0.46
	WCHS	31.29	31.46	-0.19	-0.23	0.29	-0.27
LV	**BCLS**	12.46	11.51	-0.05	0.20	-0.19	-0.05
	BCHS	33.91	33.69	0.48	0.54	-0.14	0.06
	WCLS	13.50	14.09	0.37	0.21	0.25	-0.08
	WCMS	9.14	9.31	0.19	0.15	0.04	0.00
	WCHS	30.99	31.40	0.60	0.49	0.04	0.07
PL[1)]	**BCLS**	25.60	25.76	-0.50	-0.57	0.37	-0.30
	BCHS	26.49	24.92	-1.33	-0.59	-0.76	0.01
	WCLS	10.96	11.42	-0.02	-0.24	0.15	0.06
	WCMS	7.33	7.97	0.14	-0.16	0.07	0.26
	WCHS	29.62	29.92	-0.51	-0.66	0.17	-0.03
SI	**BCLS**	16.16	14.10	-0.56	-0.05	-0.49	-0.03
	BCHS	32.08	30.32	-0.54	-0.10	0.06	-0.49
	WCLS	11.99	12.67	0.13	-0.04	0.14	0.03
	WCMS	11.66	10.59	-0.30	-0.04	0.08	-0.34
	WCHS	28.11	32.33	0.95	-0.09	0.21	0.82
SK	**BCLS**	12.52	10.73	-0.56	-0.13	-0.18	-0.28
	BCHS	34.92	35.12	-0.31	-0.36	-0.32	0.41
	WCLS	11.90	13.76	0.32	-0.12	0.17	0.26
	WCMS	8.70	6.48	-0.62	-0.09	0.06	-0.59
	WCHS	31.96	33.91	0.14	-0.33	0.27	0.20
BG[1)]	**BCLS**	19.86	17.07	-1.55	-0.18	-0.92	-0.50
	BCHS	28.92	29.43	-0.01	-0.26	-0.02	0.30
	WCLS	14.01	14.08	-0.09	-0.13	0.28	-0.25
	WCMS	6.32	6.87	0.21	-0.06	0.10	0.17
	WCHS	30.90	32.55	0.53	-0.28	0.57	0.28
RO	**BCLS**	44.64	41.49	-2.03	-1.34	-0.89	0.14
	BCHS	27.98	28.15	-0.80	-0.84	0.26	-0.22
	WCLS	6.55	7.55	0.02	-0.20	0.10	0.13
	WCMS	3.82	3.92	-0.09	-0.11	0.06	-0.04
	WCHS	17.01	18.88	-0.10	-0.51	0.47	-0.01

Notes: Numbers of columns (1)-(3) refer to the terms in the decompositional analysis. - 1) 2000-2002.

5.1.2 Educational attainment levels

Let us now show the structure of employment with respect to educational attainment levels. We concentrate here on the variables which are important for the interpretation of the calculated scenarios presented below; for a detailed study see again Landesmann et al. (2005). Similar to the occupational structures we report the employment shares of educational groups by sectors in Table 5.3 for the NMS, CC-2 and the EU-15 average. Table 5.3a reports the skill intensity of sectors (i.e. the shares of educational groups in sectoral employment) whereas Table 5.3b shows how the educational groups are distributed across sectors (i.e. the sectoral employment share of an educational group).

Table 5.3a

Educational shares by sectors

		AB	CDE	F	GH	I	JK	LQ
CZ	**LE**	0.14	0.10	0.05	0.06	0.06	0.03	0.07
	ME	0.79	0.83	0.87	0.88	0.88	0.66	0.67
	HE	0.07	0.07	0.08	0.06	0.06	0.31	0.27
EE	**LE**	0.17	0.13	0.20	0.06	0.09	0.06	0.07
	ME	0.66	0.67	0.68	0.62	0.64	0.52	0.42
	HE	0.17	0.20	0.12	0.32	0.27	0.43	0.50
HU	**LE**	0.38	0.21	0.16	0.10	0.16	0.08	0.14
	ME	0.55	0.71	0.77	0.80	0.74	0.59	0.50
	HE	0.07	0.07	0.08	0.10	0.10	0.33	0.36
LT	**LE**	0.29	0.10	0.10	0.07	0.06	0.02	0.05
	ME	0.64	0.74	0.79	0.66	0.75	0.47	0.49
	HE	0.06	0.16	0.12	0.27	0.19	0.51	0.46
LV	**LE**	0.37	0.16	0.17	0.09	0.13	0.05	0.06
	ME	0.56	0.70	0.65	0.73	0.67	0.52	0.58
	HE	0.07	0.14	0.18	0.18	0.20	0.44	0.36
PL	**LE**	0.39	0.10	0.12	0.05	0.08	0.04	0.05
	ME	0.59	0.82	0.81	0.84	0.81	0.65	0.57
	HE	0.02	0.08	0.07	0.11	0.11	0.30	0.38
SI	**LE**	0.61	0.25	0.15	0.07	0.13	0.09	0.08
	ME	0.36	0.67	0.78	0.85	0.75	0.62	0.53
	HE	0.03	0.08	0.07	0.08	0.12	0.29	0.39
SK	**LE**	0.18	0.06	0.05	0.03	0.05	0.02	0.05
	ME	0.79	0.89	0.89	0.90	0.87	0.64	0.68
	HE	0.03	0.05	0.06	0.07	0.08	0.35	0.27
BG	**LE**	0.59	0.19	0.29	0.11	0.12	0.04	0.10
	ME	0.36	0.68	0.57	0.70	0.66	0.43	0.36
	HE	0.05	0.13	0.14	0.19	0.22	0.53	0.54
RO	**LE**	0.68	0.10	0.20	0.09	0.08	0.05	0.07
	ME	0.31	0.81	0.68	0.80	0.79	0.53	0.63
	HE	0.01	0.08	0.12	0.11	0.14	0.42	0.30
EU-15	**LE**	0.61	0.34	0.43	0.35	0.30	0.15	0.19
	ME	0.32	0.49	0.46	0.52	0.54	0.47	0.42
	HE	0.07	0.17	0.11	0.12	0.16	0.38	0.39

The most striking evidence is that the medium-educated persons (ME) are overrepresented relative to the EU-15 in all sectors, which reflects the supply-side differences between the NMS, the CC-2 and the EU-15 countries. The overrepresentation of this skill category can also be seen in Figure 5.2, which shows the deviation of the NMS and CC-2 from the EU-15 average (in percentage points). In general one can see that – as one would expect – that Business and Public Services (JK and LQ) are the most skill-intensive sectors (measured by the share of highly educated [HE] employees) in all countries and that Agriculture (AB), Industry (CDE), Construction (F) and partly Transport (I) are the most low-skill-intensive industries (measured by the share of low-educated [LE] employees).

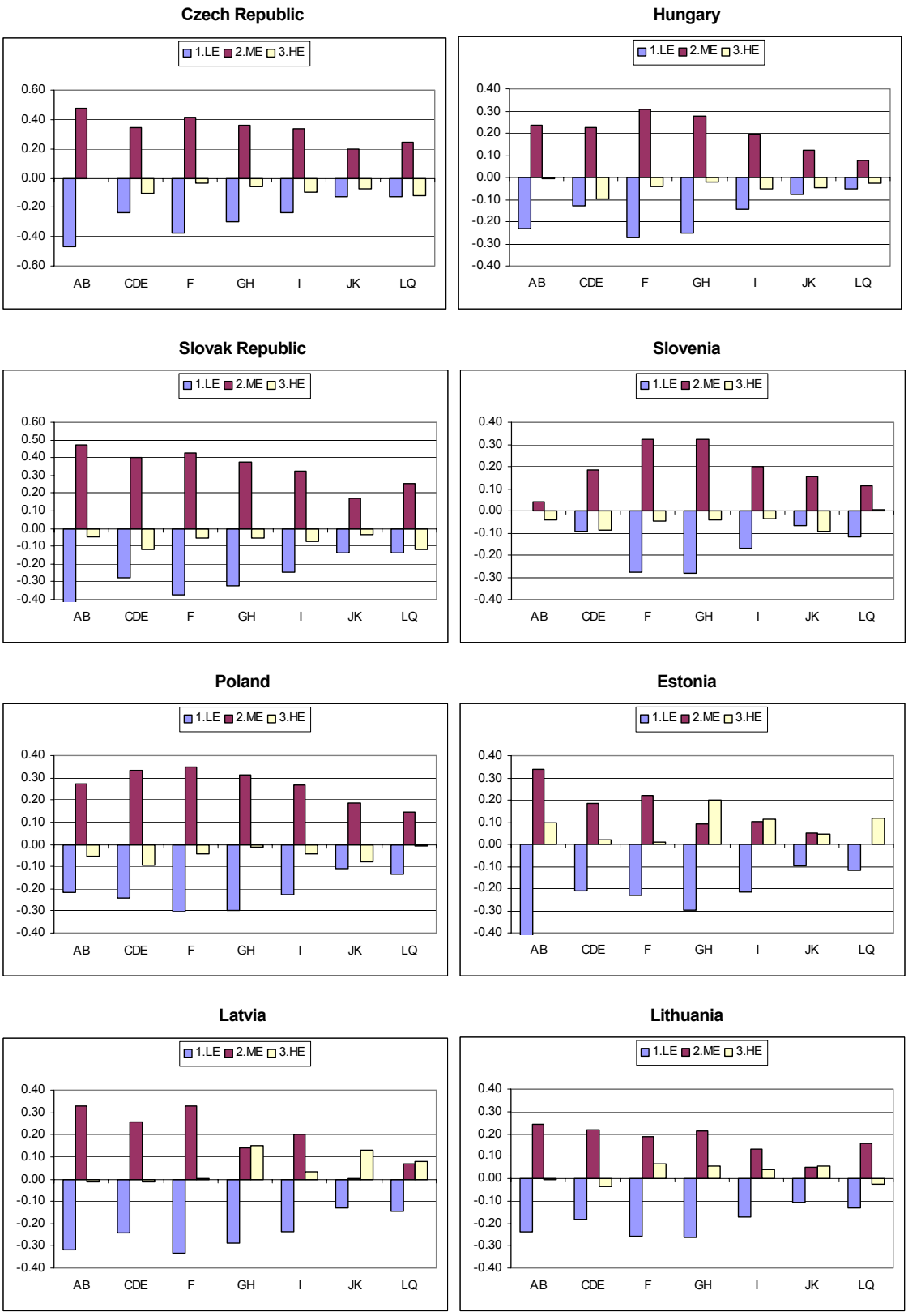
Table 5.3b

Distribution of skill groups, 2002

		AB	CDE	F	GH	I	JK	LQ
CZ	**LE**	0.09	0.43	0.06	0.12	0.07	0.03	0.20
	ME	0.05	0.33	0.1	0.19	0.09	0.06	0.19
	HE	0.03	0.16	0.05	0.08	0.03	0.18	0.46
EE	**LE**	0.11	0.33	0.12	0.11	0.09	0.06	0.18
	ME	0.07	0.29	0.07	0.20	0.11	0.08	0.18
	HE	0.03	0.15	0.02	0.19	0.08	0.13	0.39
HU	**LE**	0.14	0.35	0.07	0.11	0.08	0.04	0.21
	ME	0.05	0.3	0.08	0.22	0.09	0.07	0.19
	HE	0.02	0.12	0.03	0.11	0.05	0.15	0.52
LT	**LE**	0.50	0.18	0.06	0.10	0.03	0.01	0.11
	ME	0.19	0.23	0.09	0.17	0.07	0.04	0.20
	HE	0.05	0.13	0.03	0.18	0.04	0.09	0.48
LV	**LE**	0.40	0.21	0.07	0.10	0.08	0.02	0.11
	ME	0.13	0.21	0.06	0.20	0.09	0.04	0.26
	HE	0.05	0.12	0.05	0.13	0.07	0.10	0.47
PL	**LE**	0.57	0.17	0.05	0.06	0.03	0.02	0.09
	ME	0.16	0.26	0.07	0.19	0.07	0.07	0.18
	HE	0.03	0.11	0.03	0.11	0.04	0.14	0.54
SI	**LE**	0.31	0.43	0.05	0.07	0.04	0.03	0.08
	ME	0.05	0.34	0.07	0.23	0.07	0.07	0.17
	HE	0.02	0.18	0.03	0.09	0.05	0.13	0.50
SK	**LE**	0.21	0.31	0.07	0.09	0.07	0.02	0.23
	ME	0.06	0.33	0.09	0.18	0.08	0.05	0.21
	HE	0.01	0.12	0.04	0.09	0.05	0.18	0.52
BG	**LE**	0.33	0.28	0.08	0.12	0.05	0.01	0.13
	ME	0.07	0.34	0.05	0.25	0.09	0.04	0.15
	HE	0.02	0.14	0.03	0.15	0.07	0.11	0.49
RO	**LE**	0.81	0.08	0.03	0.03	0.01	0.00	0.04
	ME	0.20	0.35	0.05	0.14	0.07	0.02	0.17
	HE	0.04	0.2	0.05	0.10	0.06	0.09	0.44
EU-15	**LE**	0.09	0.24	0.12	0.23	0.06	0.07	0.19
	ME	0.03	0.21	0.08	0.21	0.07	0.13	0.27
	HE	0.01	0.14	0.04	0.09	0.04	0.2	0.47

Figure 5.2

Differences of educational structures from EU-15 means (percentage points)



(Figure 5.2 contd.)

Figure 5.2 (continued)

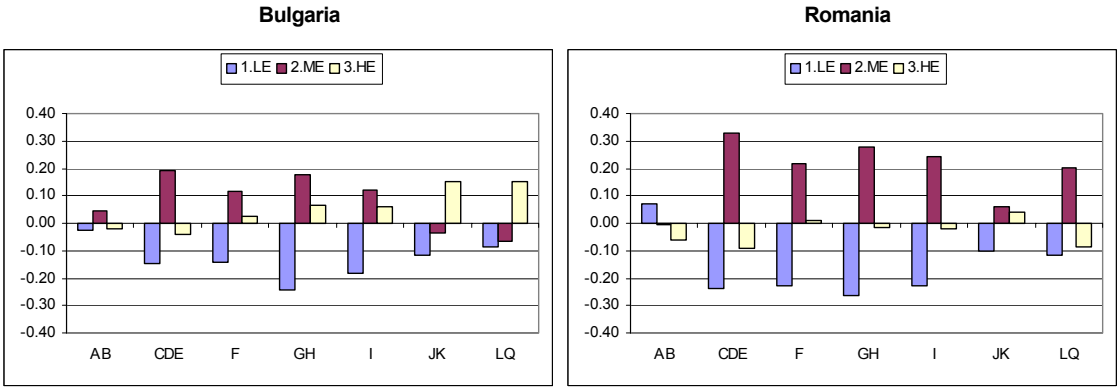


Table 5.4a

Educational shares by occupations

		BCLS	BCHS	WCLS	WCMS	WCHS
CZ	**LE**	0.30	0.10	0.09	0.04	0.01
	ME	0.69	0.90	0.89	0.91	0.65
	HE	0.01	0.00	0.02	0.05	0.34
EE	**LE**	0.28	0.14	0.08	0.06	0.01
	ME	0.59	0.76	0.71	0.73	0.38
	HE	0.13	0.10	0.21	0.21	0.61
HU	**LE**	0.56	0.20	0.13	0.10	0.02
	ME	0.43	0.79	0.83	0.83	0.48
	HE	0.01	0.01	0.04	0.07	0.50
LT	**LE**	0.26	0.11	0.07	0.06	0.00
	ME	0.68	0.82	0.78	0.72	0.37
	HE	0.06	0.06	0.15	0.22	0.62
LV	**LE**	0.32	0.20	0.11	0.05	0.03
	ME	0.63	0.75	0.82	0.77	0.48
	HE	0.05	0.05	0.08	0.18	0.49
PL	**LE**	0.37	0.11	0.07	0.03	0.00
	ME	0.61	0.88	0.89	0.87	0.53
	HE	0.01	0.01	0.04	0.10	0.47
SI	**LE**	0.63	0.27	0.07	0.11	0.01
	ME	0.35	0.73	0.92	0.84	0.54
	HE	0.02	0.00	0.02	0.05	0.45
SK	**LE**	0.24	0.06	0.05	0.04	0.01
	ME	0.75	0.94	0.93	0.91	0.63
	HE	0.01	0.00	0.03	0.05	0.36
BG	**LE**	0.54	0.23	0.15	0.04	0.02
	ME	0.43	0.73	0.75	0.77	0.33
	HE	0.03	0.04	0.10	0.19	0.65
RO	**LE**	0.66	0.11	0.12	0.02	0.01
	ME	0.34	0.87	0.85	0.90	0.50
	HE	0.00	0.02	0.02	0.07	0.50
EU-15	**LE**	0.57	0.38	0.31	0.17	0.08
	ME	0.40	0.57	0.61	0.68	0.41
	HE	0.03	0.05	0.08	0.15	0.51

Table 5.4 further presents the educational shares within the five occupational groups discussed in section 5.1.1 and Figure 5.3 shows the differences from the EU-15 means in percentage points.

Table 5.4b

Occupational shares by educational levels

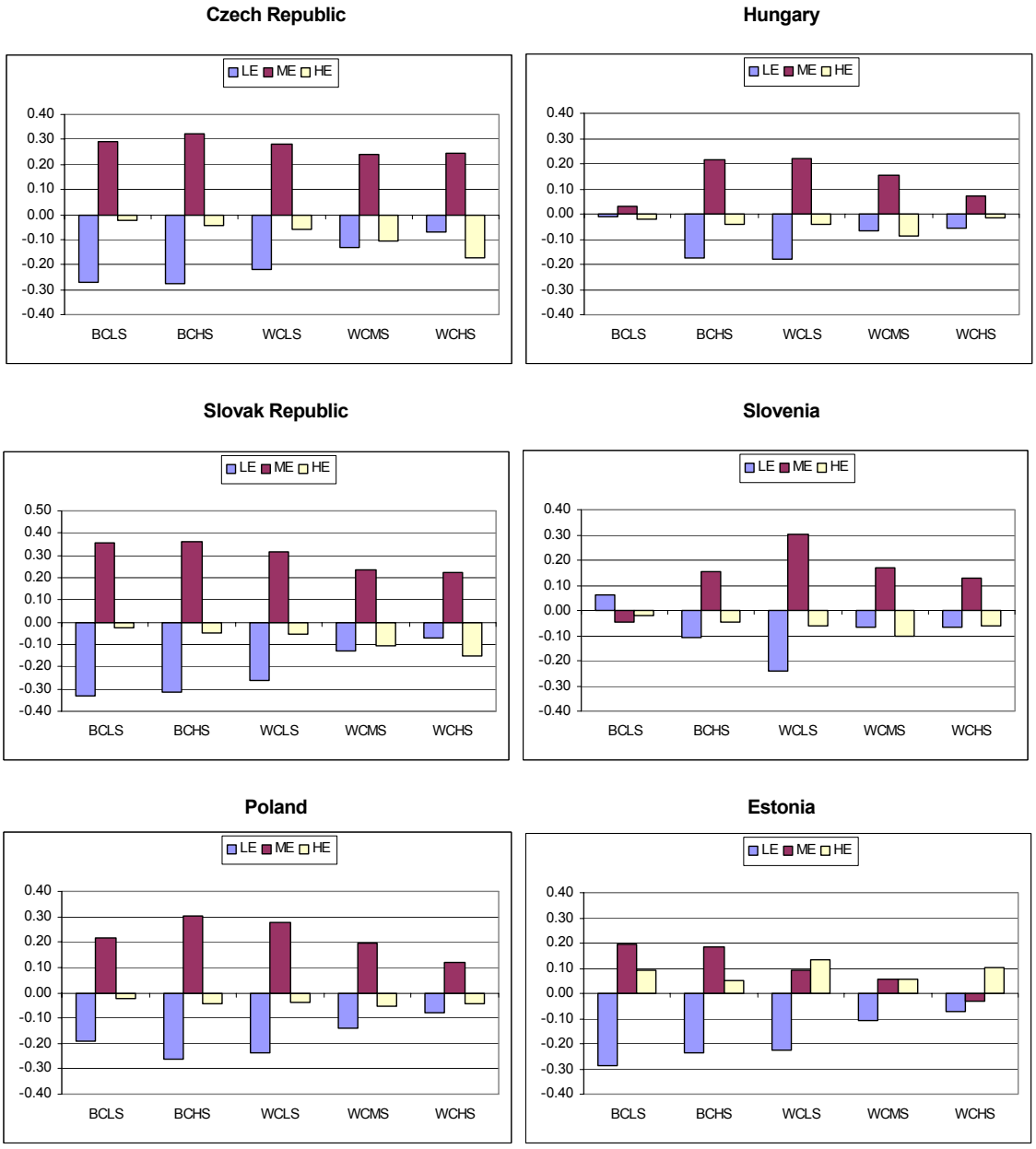
		BCLS	BCHS	WCLS	WCMS	WCHS
CZ	**LE**	0.32	0.45	0.15	0.04	0.04
	ME	0.07	0.40	0.14	0.10	0.30
	HE	0.01	0.01	0.02	0.03	0.93
EE	**LE**	0.41	0.42	0.10	0.03	0.03
	ME	0.15	0.39	0.15	0.06	0.25
	HE	0.06	0.09	0.08	0.03	0.73
HU	**LE**	0.38	0.41	0.11	0.06	0.04
	ME	0.07	0.40	0.18	0.12	0.23
	HE	0.01	0.02	0.03	0.04	0.91
LT	**LE**	0.63	0.27	0.07	0.02	0.01
	ME	0.28	0.35	0.15	0.04	0.18
	HE	0.06	0.07	0.07	0.03	0.77
LV	**LE**	0.48	0.34	0.10	0.02	0.07
	ME	0.21	0.29	0.17	0.06	0.27
	HE	0.05	0.06	0.05	0.04	0.81
PL	**LE**	0.71	0.21	0.06	0.02	0.00
	ME	0.22	0.31	0.14	0.10	0.22
	HE	0.02	0.01	0.03	0.05	0.89
SI	**LE**	0.46	0.42	0.04	0.06	0.02
	ME	0.08	0.34	0.18	0.14	0.27
	HE	0.01	0.01	0.01	0.03	0.93
SK	**LE**	0.44	0.37	0.11	0.04	0.03
	ME	0.10	0.41	0.16	0.07	0.26
	HE	0.01	0.01	0.03	0.02	0.94
BG	**LE**	0.48	0.36	0.11	0.02	0.03
	ME	0.13	0.39	0.19	0.10	0.19
	HE	0.02	0.05	0.06	0.05	0.83
RO	**LE**	0.86	0.10	0.03	0.00	0.01
	ME	0.24	0.42	0.11	0.06	0.16
	HE	0.01	0.04	0.02	0.03	0.90
EU-15	**LE**	0.26	0.36	0.17	0.08	0.12
	ME	0.10	0.24	0.17	0.18	0.31
	HE	0.02	0.06	0.05	0.09	0.79

Table 5.4a reflects the fact that the medium-educated employees have the by far highest shares in total employees. (For more details and a further breakdown of the ME into three categories see Landesmann et al., 2005.) Let us again first discuss the numbers for the EU-15 average. As expected, BCLS jobs have the highest shares and WCHS jobs the lowest shares of low-educated employees compared to the other occupational categories; the latter are in between. The medium-educated are mainly present in the BCHS, WCLS and WCMS jobs and less so in the BCLS and WCHS jobs. Finally, more than 50% of all

WCHS are held by highly educated persons, by far more than in the other occupational categories. Figure 5.3 compares these shares of the EU-15 to the NMS and CC-2. One finds again that the low-educated are underrepresented relative to the EU-15 mean whereas the medium-educated employees are overrepresented, again reflecting the supply side of the economies. For most countries also the highly educated people are underrepresented in all occupational categories. These results mean that the supply side of the economy plays a role in the educational structures by sectors and occupations.

Figure 5.3 **Differences of educational shares by occupations from EU-15 means**

(percentage points)



(Figure 5.3 contd.)

Figure 5.3 (continued)

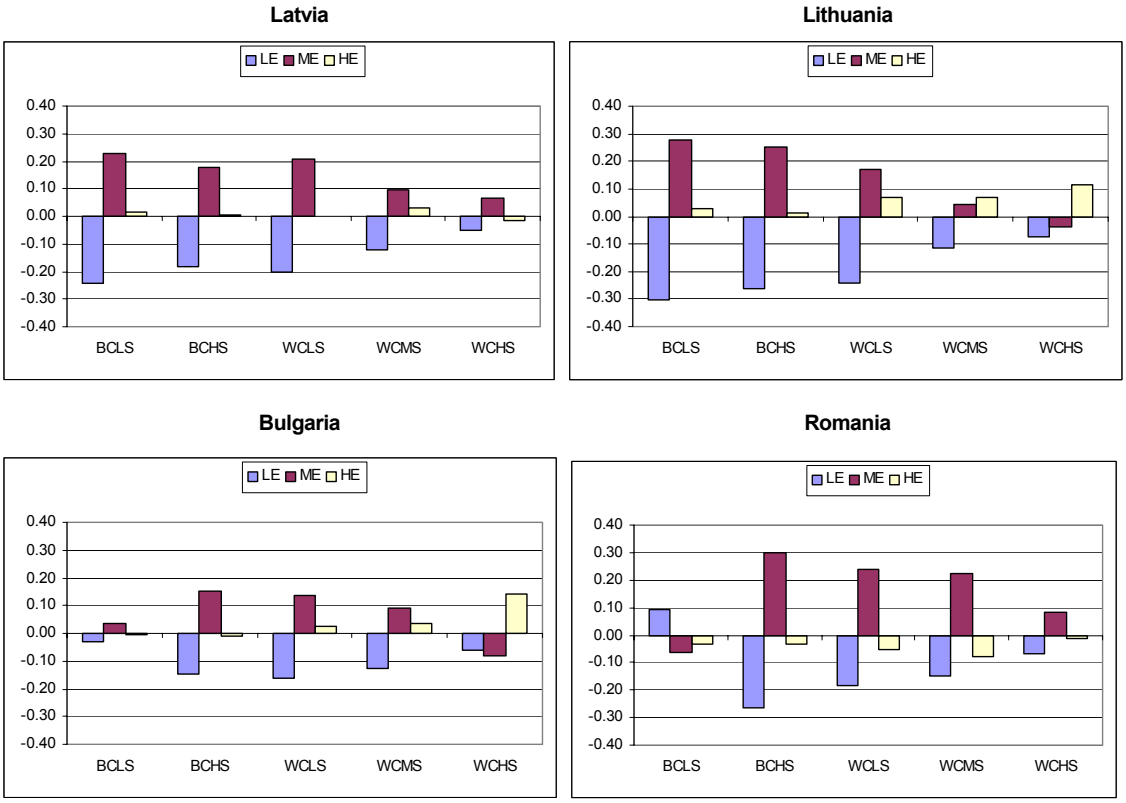


Table 5.4b presents information on the distribution of occupations by educational attainment levels. First, the largest share of highly educated people is working in WCHS jobs (ranging from 73% in Estonia to 94% in the Slovak Republic) which is in line with the evidence for the EU-15 countries; in most NMS and CC-2, however, the distribution is even more skewed. The medium-educated persons are mainly employed in BCHS jobs and in some countries also have higher shares in WCLS and even WCMS jobs (e.g. Slovenia and Hungary). In countries with a higher share of agricultural employment, the medium-educated also show larger shares in BCLS jobs (e.g. Estonia, Lithuania, Latvia, Poland and CC-2). Finally, the low-educated are mainly active in BCLS and BCHS jobs; again, in countries with relatively more employment in agricultural employment, more low-educated persons are working in BCLS jobs.

Let us now look at the changes in demand for skill groups and the underlying forces. For this we use again a decomposition analysis. The decomposition analysis is similar to the analysis for occupational groups above – see equation (5.1) – but we start with labour demand for a particular skill group given by $L_{ioe} = L\gamma_i\gamma_{io}\gamma_{ioe}$ where *e* denotes the educational attainment level. The decomposition is then given by

$$\Delta L_{ioe} = \Delta L\gamma_i\gamma_{io}\gamma_{ioe} + L\Delta\gamma_i\gamma_{io\gamma}\gamma_{ioe} + L\gamma_i\Delta\gamma_{io}\gamma_{ioe} + L\gamma_i\gamma_{io}\Delta\gamma_{ioe} +$$
$$+ \Delta L\Delta\gamma_i\gamma_{io}\gamma_{ioe} + \Delta L\gamma_i\Delta\gamma_{io}\gamma_{ioe} + L\Delta\gamma_i\Delta\gamma_{io}\gamma_{ioe} + \Delta L\gamma_i\gamma_{io}\Delta\gamma_{ioe} + L\Delta\gamma_i\gamma_{io}\Delta\gamma_{ioe} + L\gamma_i\Delta\gamma_{io}\Delta\gamma_{ioe} +$$
$$+ \Delta L\Delta\gamma_i\Delta\gamma_{io}\gamma_{ioe} + \Delta L\Delta\gamma_i\gamma_{io}\Delta\gamma_{ioe} + \Delta L\gamma_i\Delta\gamma_{io}\Delta\gamma_{ioe} + L\Delta\gamma_i\Delta\gamma_{io}\Delta\gamma_{ioe}$$
$$+ \Delta L\Delta\gamma_i\Delta\gamma_{io}\Delta\gamma_{ioe}$$

(5.2)

Table 5.5

Decomposition analysis of occupational structures, 1998-2002

		Shares			Decomposition			
		Initial year	2002	Change in demand	(1)	(2)	(3)	(4)
CZ	**LE**	9.46	7.56	-0.51	-0.05	-0.02	-0.18	-0.31
	ME	79.42	79.42	-0.42	-0.42	-0.07	0.15	-0.03
	HE	11.12	13.02	0.41	-0.06	0.10	0.03	0.35
EE	**LE**	12.03	9.92	-0.52	-0.13	-0.18	0.10	-0.39
	ME	55.99	58.23	-0.08	-0.63	-0.09	0.08	0.54
	HE	31.98	31.85	-0.32	-0.36	0.26	-0.16	0.03
HU	**LE**	18.74	16.68	-0.25	0.30	-0.13	-0.03	-0.34
	ME	65.25	66.10	1.26	1.04	0.13	0.00	0.07
	HE	16.01	17.22	0.57	0.25	0.00	0.02	0.26
LT[2)]	**LE**	12.66	10.98	-0.51	-0.09	-0.11	0.17	-0.50
	ME	43.08	63.42	4.61	-0.32	-0.10	0.17	5.19
	HE	44.27	25.60	-4.70	-0.32	0.21	-0.23	-4.63
LV	**LE**	14.10	14.31	0.08	0.00	-0.30	-0.20	0.57
	ME	66.80	63.55	-0.80	0.01	-0.01	-0.11	-0.64
	HE	19.10	22.14	0.80	0.00	0.31	0.33	0.13
PL[1)]	**LE**	14.91	13.58	-0.95	-0.33	0.07	-0.09	-0.63
	ME	71.32	70.69	-1.89	-1.58	-0.21	0.09	-0.15
	HE	13.77	15.73	0.63	-0.31	0.14	0.00	0.78
SI	**LE**	23.02	19.38	-0.97	-0.07	-0.33	-0.16	-0.46
	ME	61.92	64.97	0.56	-0.19	0.21	-0.18	0.74
	HE	15.06	15.65	0.10	-0.05	0.12	0.35	-0.27
SK	**LE**	9.67	5.77	-1.03	-0.10	-0.10	-0.06	-0.85
	ME	78.40	81.16	-0.15	-0.81	-0.04	0.00	0.81
	HE	11.93	13.07	0.16	-0.12	0.15	0.07	0.06
BG[1)]	**LE**	22.31	18.86	-1.90	-0.20	-0.76	-0.18	-0.92
	ME	55.17	55.50	-0.34	-0.50	0.30	0.06	-0.05
	HE	22.52	25.64	1.34	-0.20	0.46	0.12	0.98
RO	**LE**	36.46	31.70	-2.14	-1.09	-0.63	0.06	-0.63
	ME	55.20	57.87	-1.07	-1.65	0.39	-0.06	0.37
	HE	8.34	10.43	0.21	-0.25	0.24	0.00	0.26

Notes: Numbers of columns (1)-(4) refer to the terms in the decompositional analysis. - 1) 2000-2002. - 2) Break in time series.

On the left-hand side, ΔL_{ioe} denotes the change of labour demand of skill category *e* in occupation *o* and in sector *i*. Summing up over sectors and occupations shows the changes for educational groups. The results of this analysis are presented in Table 5.5 where we only show the direct effects (i.e. the first four terms) of the decomposition as the mixed effects are rather small (the numbers of columns [1]-[4] correspond to the first four terms in the equation above).[9] The first two columns report the shares of the educational groups in total employment in the initial and last years.

In all countries the share of low-educated employees was decreasing over the period considered whereas the share of highly educated employees was increasing. The evidence for the medium-educated is mixed.[10] Overall employment growth contributed to the changes in educational demand according to the share of skill demand in total employment (column [1]). In column [2] of Table 5.5 the impact of changes in the sectoral structure on educational demand are calculated. Sectoral change contributed negatively to demand for low-educated persons in all countries. An exception to this is Poland; for the Czech Republic the contribution of structural change is low. For medium-educated persons structural change contributed negatively in the case of most countries but positively in Hungary, Slovenia and the CC-2. For the highly educated structural change contributed positively to employment demand. With respect to changes in the occupational structure the effect on demand for low-educated is in most cases negative; it is positive for Estonia, Lithuania (see footnote 10) and Romania. The evidence for the medium-educated is mixed and for highly educated persons mainly positive. Finally, column [4] presents the effects of changes in the educational structure by occupations. First, there is a clearly negative effect on demand for low-educated persons in all countries with the exception of Latvia. The evidence for medium-educated persons is mixed but mainly positive or negative with a small magnitude (the main exception to this is again Latvia). Finally, the effect on demand for highly educated persons is in most cases positive. This means that though the low-educated persons are underrepresented in all occupational categories as compared to the EU-15 (see Figure 5.3 and also Figure 5.2 for the underrepresentation by sectors) this pattern was even reinforced by the ongoing structural changes. A potential explanation for this is that high unemployment rates lead to a substitution of medium-educated persons for low-educated ones (i.e. a displacement of the low-educated employees). It is questionable whether this trend will continue in the future. In the scenarios below we show a less pessimistic scenario for the low-educated employees by assuming that the skill structure by occupation does not change.

[9] The more detailed results by sectors and occupational categories can be requested from the author.

[10] The LFS for Lithuania shows a break in the time series due to changes in the educational definitions. The numbers presented are thus not reliable for this country.

5.2 Scenario results

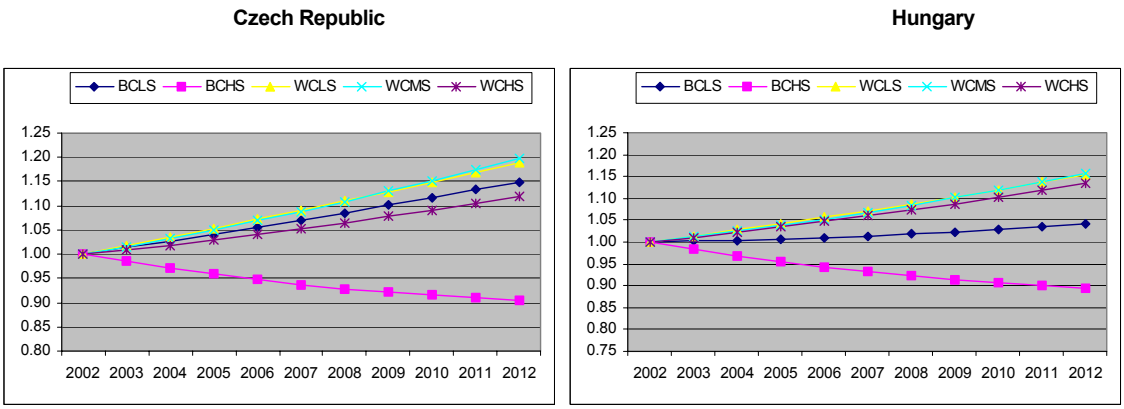
5.2.1 Demand for occupations

Let us now come to the scenarios with respect to education levels and occupations. For the occupational structure we assumed convergence to the EU-15 mean using the same convergence parameters as for productivity (see Table 4.6). Figure 5.4 shows the results of the changes in employment demand by occupations for the ten countries. Appendix Table A.6 presents the absolute numbers.

The group that suffers most from the ongoing changes are the blue-collar-high-skilled workers (BCHS). In the more advanced NMS: the Czech Republic, Hungary, the Slovak Republic and Slovenia, demand for this group decreases by about 10%, whereas demand for the other groups is increasing. The only exception here is Slovenia where demand for the blue-collar-low-skilled (BCLS) is also decreasing to about 95% of its 2002 level. The increase in demand is highest for the white-collar-low-skilled (WCLS) and white-collar-medium-skilled (WCMS) group with an increase of 20% (slightly less for Hungary). A similar pattern is found for Estonia. For the other countries of the less advanced NMS (Poland, Latvia and Lithuania) demand for the blue-collar-low-skilled (BCLS) is falling dramatically to a level of 75% relative to the year 2002 whereas demand for the blue-collar-high-skilled workers is shrinking by about 10%. Demand for the other groups is increasing (an exception is Latvia where demand for the white-collar-high-skilled, WCHS, is decreasing as well) at partly high rates. A similar pattern can also be seen in Bulgaria and Romania where demand for BCLS and BCHS workers decreases between 25% and 35%. In Bulgaria employment for the other groups remains more or less constant whereas in Romania employment levels of the other groups are even rising.

Figure 5.4

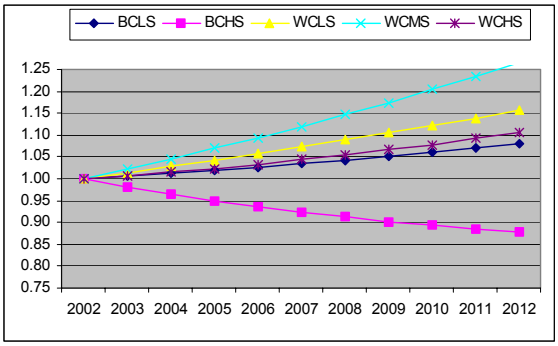
Employment scenarios by occupations



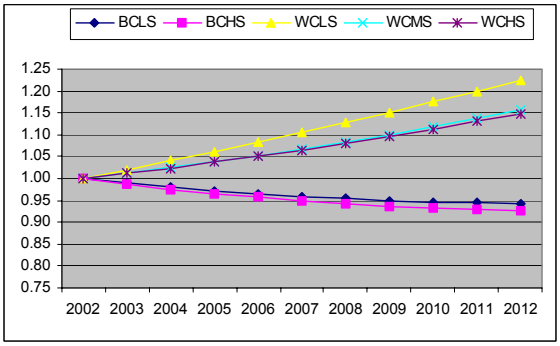
(Figure 5.4 contd.)

Figure 5.4 (continued)

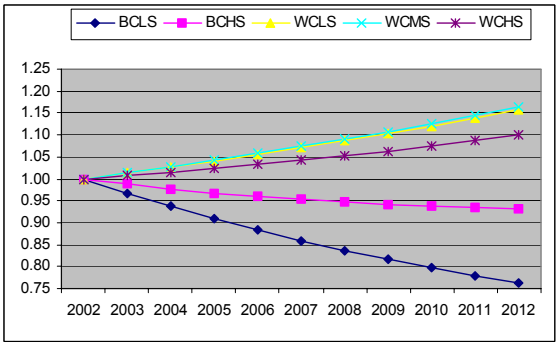
Slovak Republic



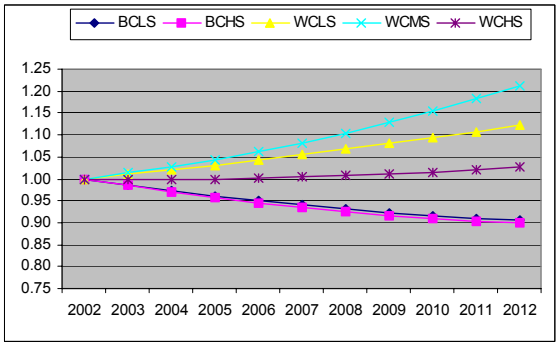
Slovenia



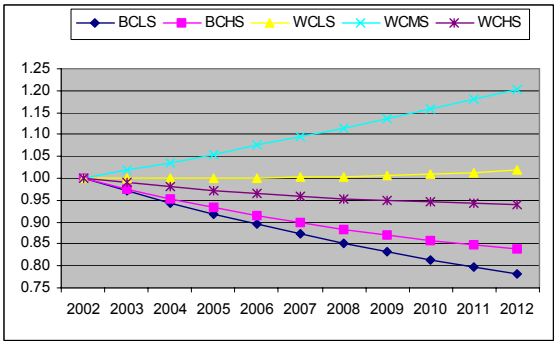
Poland



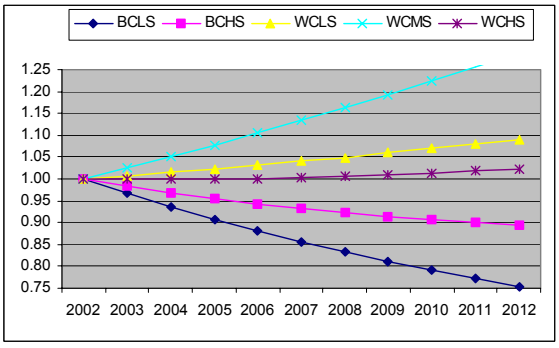
Estonia



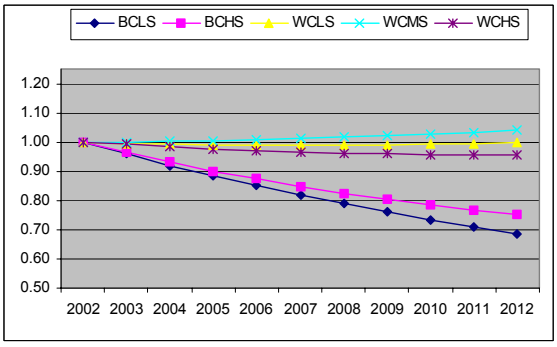
Latvia



Lithuania



Bulgaria



Romania

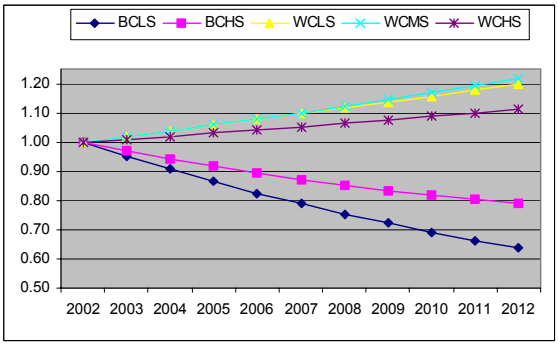


Table 5.6

Decomposition analysis of occupational structures

		Shares			Decomposition		
		2002	2012	Change in demand	(1)	(2)	(3)
CZ	**BCLS**	8.09	9.30	0.10	0.04	-0.02	0.08
	BCHS	34.57	31.28	-0.27	0.18	-0.34	-0.12
	WCLS	12.66	15.06	0.20	0.07	0.12	0.00
	WCMS	8.50	10.18	0.14	0.04	0.01	0.08
	WCHS	36.18	40.52	0.36	0.19	0.22	-0.04
EE	**BCLS**	14.84	13.43	-0.12	-0.01	-0.09	-0.02
	BCHS	30.18	27.12	-0.26	-0.03	-0.16	-0.08
	WCLS	12.19	13.67	0.12	-0.01	0.11	0.02
	WCMS	4.58	5.54	0.08	0.00	-0.03	0.11
	WCHS	38.22	39.23	0.08	-0.03	0.16	-0.04
HU	**BCLS**	11.62	12.09	0.04	0.05	-0.05	0.05
	BCHS	33.35	29.85	-0.29	0.14	-0.28	-0.15
	WCLS	13.95	16.09	0.18	0.06	0.15	-0.02
	WCMS	9.28	10.74	0.12	0.04	0.01	0.07
	WCHS	31.81	36.12	0.36	0.13	0.18	0.05
LT	**BCLS**	25.42	19.18	-0.52	-0.13	-0.39	-0.03
	BCHS	26.84	24.00	-0.24	-0.14	-0.02	-0.09
	WCLS	11.93	13.01	0.09	-0.06	0.14	0.02
	WCMS	4.01	5.17	0.10	-0.02	0.02	0.10
	WCHS	31.81	32.56	0.06	-0.16	0.25	0.00
LV	**BCLS**	20.78	16.23	-0.38	-0.17	-0.23	0.00
	BCHS	25.10	21.04	-0.34	-0.20	-0.10	-0.07
	WCLS	13.18	13.42	0.02	-0.10	0.14	0.01
	WCMS	4.76	5.72	0.08	-0.04	0.02	0.11
	WCHS	36.18	34.05	-0.18	-0.29	0.17	-0.05
PL	**BCLS**	25.52	19.44	-0.51	-0.04	-0.48	-0.01
	BCHS	24.95	23.24	-0.14	-0.04	-0.06	-0.06
	WCLS	11.40	13.18	0.15	-0.02	0.19	-0.01
	WCMS	7.99	9.30	0.11	-0.01	0.06	0.06
	WCHS	30.14	33.13	0.25	-0.04	0.29	0.02
SI	**BCLS**	13.45	12.69	-0.06	0.07	-0.18	0.05
	BCHS	29.70	27.49	-0.18	0.16	-0.30	-0.04
	WCLS	12.28	15.03	0.23	0.07	0.17	-0.01
	WCMS	10.64	12.31	0.14	0.06	0.04	0.03
	WCHS	33.93	38.98	0.42	0.18	0.27	-0.03
SK	**BCLS**	10.60	11.43	0.07	0.04	-0.03	0.07
	BCHS	35.06	30.84	-0.35	0.12	-0.33	-0.16
	WCLS	13.80	15.96	0.18	0.05	0.16	-0.02
	WCMS	6.49	8.21	0.14	0.02	0.01	0.10
	WCHS	34.05	37.63	0.30	0.12	0.19	0.00
BG	**BCLS**	27.31	18.74	-0.71	-0.37	-0.44	0.04
	BCHS	26.95	20.23	-0.56	-0.37	-0.15	-0.10
	WCLS	11.45	11.41	0.00	-0.16	0.22	-0.03
	WCMS	6.15	6.41	0.02	-0.08	0.04	0.08
	WCHS	28.15	26.85	-0.11	-0.38	0.33	0.01
RO	**BCLS**	40.37	25.72	-1.22	-0.54	-0.81	-0.01
	BCHS	28.27	22.27	-0.50	-0.38	0.03	-0.16
	WCLS	7.92	9.48	0.13	-0.11	0.28	0.01
	WCMS	4.01	4.88	0.07	-0.05	0.07	0.07
	WCHS	19.43	21.62	0.18	-0.26	0.44	0.09

Note: Numbers of columns refer to the terms in the decompositional analysis

Similar to the above one can decompose the total change in demand for labour by sector and occupation using the decomposition analysis by equation (5.1). The results together with the shares of the particular occupational groups in total employment for 2002 and 2012 are presented in Table 5.6.[11]

For the countries with a relatively lower share of employment in agriculture (the Czech Republic, Hungary, the Slovak Republic and Slovenia) the effect of structural change is particularly strong for the BCHS workers, whereas in countries with a higher initial employment share in agriculture the effect of structural change is particularly strong for the group BCLS (particularly so for Bulgaria, Romania, Lithuania and Poland). For the first group of countries (and also Estonia) this mainly reflects the decrease of employment in Industry (CDE). For the second group the decline in agricultural employment matters most for the employees in BCLS jobs. Furthermore the structural effect is positive in all countries for WCLS and WCHS workers – a pattern which can also be found in the past evidence presented in Table 5.2. Finally, changes in demand due to changes in the occupational structures within sectors (column [3] in Table 5.4) are particularly strong and negative for the BCHS workers. This reflects the evidence presented above that the BCHS workers are overrepresented in some sectors (see Figure 5.1) and the assumption that the occupational structure converges to the EU-15 averages. With respect to this term there is however less conformity with the empirical evidence presented in Table 5.2 as – at least for some countries – the shift of occupations within sectors was negative for BCLS and positive for BCHS jobs. For WCHS jobs this scenario is in some cases not in line with the evidence where a stronger positive effect is found in Table 5.2 whereas for the WCMS jobs the differences go in any direction.

These comparisons to the period 1998-2002 mean that the results presented above should be qualified by the following points (although one should bear in mind that the period 1998-2002 is quite short to extrapolate trends for the occupational structures): First, the effects of *structural change* are higher in the scenario than in the past evidence. This matters mainly for the BCLS and BCHS workers, in so far as the negative effect on the BCLS workers is underestimated whereas the negative effect on the BCHS workers is overestimated, especially for the more advanced economies. These effects are mainly the consequences of the model presented in section 4 where partly structural changes are more pronounced than in the period 1998-2002. With respect to the *occupational structure within each sector* the assumption of convergence to the EU-15 is questionable and again overestimates the negative effect on BCHS jobs and underestimates the effects on BCLS jobs (as compared to the past evidence). For the WCHS jobs the scenario thus seems to be too pessimistic and for the WCMS jobs too optimistic when compared to the evidence given in Table 5.2. However, in terms of magnitudes the sectoral composition is much

[11] The results by sectors and the absolute numbers of the decomposition can be requested from the author.

more important in the scenarios than the changes in the occupational structures. This is only partly the case for the period 1998-2002. Concluding, one may say that our projections result in a less dramatic structural change with respect to occupational structures when compared to the recent trends which suggest that mainly the BCLS workers suffer from ongoing structural changes. In a next research step this assumption of convergence of occupational structures within industries to the EU-15 average can be replaced by more country-specific adjustments in the medium run. But a simple extrapolation of the currently observed trends may also be misleading in the medium run. For this reason and for a better comparability across countries, we stick to this assumption in the further analysis of changes in demand for educational attainment levels, to which we turn next.

5.2.2 Demand for educational attainment levels

As mentioned above, we assume that the educational structure within sectors and occupations remains constant over time. This implies that changes in demand for educational groups result only from the dynamics of total employment, of structural changes and of changes in the occupational structures. Figure 5.5 presents the results for the educational groups. The levels and changes in absolute figures are presented in Table A.7 in the Appendix. In this table we also present figures resulting from an assumption of a GDP growth rate of 5% per annum, a scenario also used in section 6. The assumption of an increase in the trend growth rate of GDP of one percentage point implies that the labour demand growth rates are also rising by about 1 percentage point, as productivity convergence and the dynamics of shares are not dependent on GDP growth.

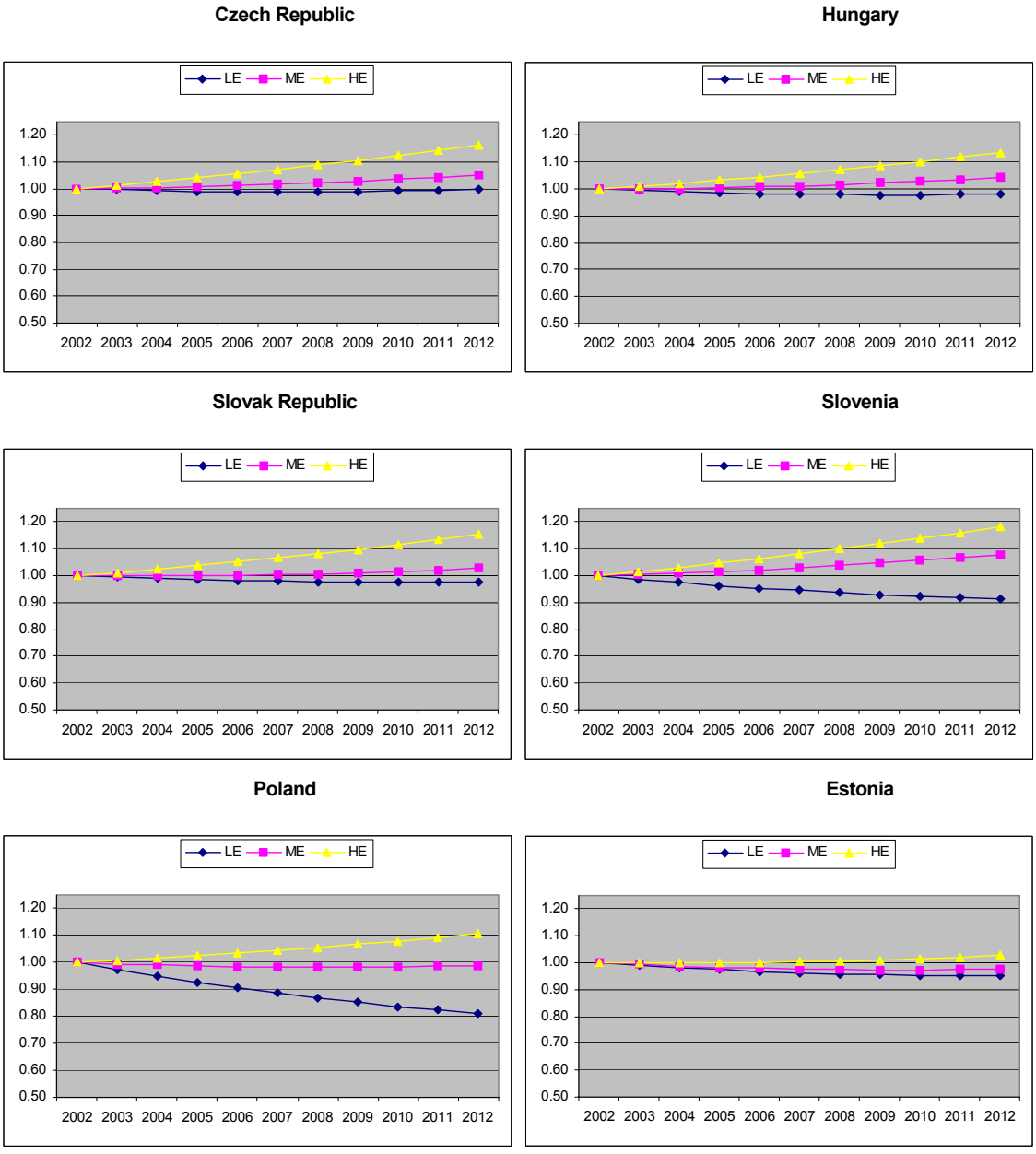
The relative pattern of the dynamics of demand for different educational levels is similar in all countries. The group that is suffering most from the ongoing changes are the low-educated persons; demand is relatively rising for the highly educated in all countries. However, there are differences across countries with respect to overall demand for education. Whereas in the Czech Republic, Hungary and the Slovak Republic demand for HE and ME is increasing by about 15% and 5% respectively, demand for the LE is constant or decreasing only slightly. The situation is different for Slovenia, where demand for the LE is falling to 90% of the 2002 level, whereas demand for ME and HE is rising even more than in the three countries discussed before.

A similar picture emerges for Poland, where demand for LE is falling to about 80%, demand for the ME remains constant and demand for HE is rising to a level 10% higher than in 2002. Estonia shows the least differentiated picture with respect to relative developments. There are only slight increases in demand for HE and only slight decreases in demand for ME and LE. In Latvia and Lithuania demand for all groups is decreasing (demand for HE remains more or less constant in Lithuania) and even more so for the

LE group. Finally, the situation for the low-educated persons in Bulgaria and Romania is even worse. In Bulgaria 30% and in Romania about 35% of the low-educated employees will lose their jobs. The situation is less dramatic but still very severe for the medium-educated group where employment is 15% (Bulgaria) and 10% (Romania) below the 2002 level. Demand for the highly educated group will fall only by about 3% in Bulgaria and will even rise in Romania.

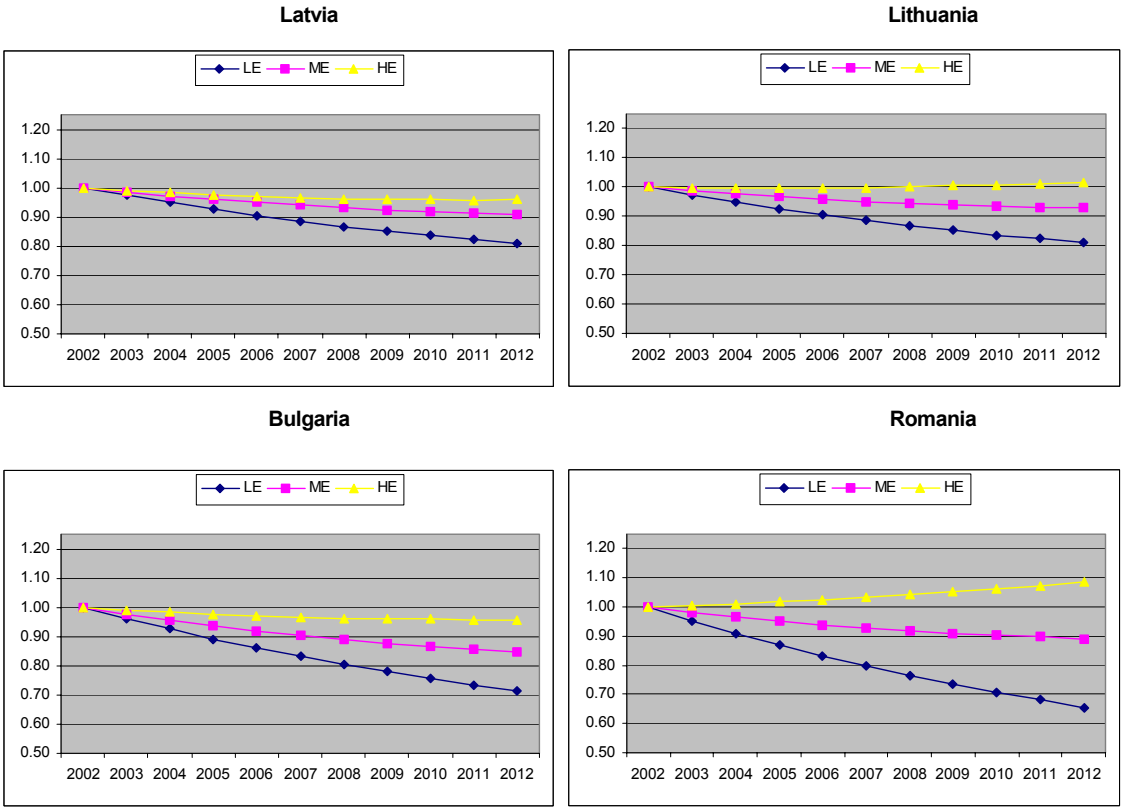
Figure 5.5

Employment scenarios by educational levels



(Figure 5.5 contd.)

Figure 5.5 (continued)



Again, we can use the decomposition analysis shown in equation [5.2] to disentangle the various effects on demand by educational levels in analogy to the analysis of the past evidence. Table 5.7 presents the results (again only the four direct effects are reported) and the shares of educational groups in total employment for 2002 and 2012.

The results can be summarized as follows: First, the effect of structural shifts on demand for the low-educated workers is negative in all countries and particularly strong (in absolute terms) for Romania and Bulgaria, which have a high initial share of employment in agriculture (AB). For the medium-educated group the effect of structural change on demand (column [2]) is mixed: it is negative for the Czech Republic, Estonia, Hungary, Lithuania and the Slovak Republic, and positive for the other countries. For the group of highly educated employees the effect of structural change on demand is positive in all cases. The effect of a change in the occupational structure within sectors is very small in this scenario and, finally, the fourth effect is equal to zero for construction (as we assumed a constancy in educational shares by occupation). This latter result implies that the projections are more favourable as compared to the past evidence for the LE group; nonetheless, the LE turn out to be the group which is suffering most from the ongoing structural changes.

Table 5.7

Decomposition analysis of educational structures

		Shares		Decomposition				
		2002	2012	Change in demand	(1)	(2)	(3)	(4)
CZ	**LE**	7.53	7.06	0.00	0.04	-0.04	0.01	0.00
	ME	79.26	78.47	0.35	0.42	-0.07	0.00	0.00
	HE	13.21	14.46	0.18	0.07	0.11	-0.01	0.00
EE	**LE**	10.02	9.63	-0.04	-0.01	-0.03	0.00	0.00
	ME	58.08	57.28	-0.11	-0.05	-0.07	0.01	0.00
	HE	31.91	33.09	0.07	-0.03	0.10	0.00	0.00
HU	**LE**	16.68	15.58	-0.03	0.07	-0.09	0.00	0.00
	ME	65.82	65.47	0.24	0.27	-0.02	-0.01	0.00
	HE	17.50	18.94	0.20	0.07	0.11	0.01	0.00
LT	**LE**	10.78	9.29	-0.17	-0.05	-0.12	0.00	0.00
	ME	63.39	62.70	-0.37	-0.32	-0.06	0.00	0.00
	HE	25.83	28.00	0.04	-0.13	0.18	0.01	0.00
LV	**LE**	14.29	12.76	-0.23	-0.11	-0.13	0.00	0.00
	ME	63.73	63.96	-0.49	-0.51	0.01	0.01	0.00
	HE	21.98	23.28	-0.08	-0.17	0.11	0.00	0.00
PL	**LE**	13.49	11.11	-0.21	-0.02	-0.20	0.00	0.00
	ME	70.65	71.04	-0.07	-0.10	0.03	0.00	0.00
	HE	15.86	17.85	0.14	-0.02	0.16	0.00	0.00
SI	**LE**	18.76	16.12	-0.13	0.10	-0.23	0.01	0.00
	ME	64.72	65.57	0.43	0.35	0.07	0.00	0.00
	HE	16.52	18.32	0.25	0.09	0.16	-0.01	0.00
SK	**LE**	5.71	5.36	-0.01	0.02	-0.03	0.01	0.00
	ME	81.14	80.07	0.18	0.28	-0.08	-0.01	0.00
	HE	13.15	14.57	0.17	0.04	0.12	0.00	0.00
BG	**LE**	25.47	21.72	-0.61	-0.35	-0.32	0.00	0.00
	ME	52.29	52.80	-0.68	-0.71	0.04	-0.01	0.00
	HE	22.24	25.47	-0.08	-0.30	0.27	0.00	0.00
RO	**LE**	30.93	24.17	-0.89	-0.41	-0.56	-0.01	0.00
	ME	58.35	61.97	-0.53	-0.78	0.31	-0.01	0.00
	HE	10.71	13.86	0.08	-0.14	0.25	0.02	0.00

Note: Numbers of columns refer to the terms in the decompositional analysis.

6 Demand and supply for educations – potential mismatches

These projections of demand for labour and especially demand by educational attainment groups can be compared to projections of supply by educational groups. In this section we first present the current structure of working-age population, then show the details of the projections and the results and, finally, we make some comparisons between the demand and supply forecasts which allow to draw conclusions on potential supply and demand mismatches.

6.1 Structure of working-age population

Before going into the details of the supply projections, let us discuss the structure of total working-age population (15-64) with respect to working status (employed, unemployed, and inactive) and educational attainment levels. Table 6.1 shows the absolute levels and

shares of total population by educational group with respect to this variables as well as the unemployment rates – i.e. unemployed/(employed + unemployed) – for the different educational groups.

The activity rates in an economy depend on many factors, such as demography, pension system, agricultural system, overall unemployment, etc. We do not go into details here but just provide some description of the current state. Activity rates (i.e. employed plus unemployed relative to working-age population) are between 60% and 70% for total population in all countries. As for educational groups there is a clear distinction between the LE and the ME and HE groups. The latter show activity rates between 70% and 90%; in all countries the activity rates are higher for the HE than for the LE. There are some more differences for the LE group. Activity rates are at about 30-35% for most of the NMS with the exception of Latvia and Slovenia, for which they are at more than 40%. As for the CC-2, the rates are at 40% in Bulgaria and nearly 50% in Romania. But these are still lower than for the EU-15, with a rate of more than 50%. The reverse is the case for the inactivity rates by definition.

The share of unemployed relative to the working-age population is quite high – 10% or more – in Latvia, Lithuania, Poland, the Slovak Republic and Bulgaria. The other countries' shares – between 3% and 6% – are comparable to the EU-15 average. By educational attainment the shares are in most cases higher for the LE and ME groups. This is particularly the case for the countries with high shares of unemployed in total working-age population mentioned above, which thus mainly results from high unemployment of the LE (despite the fact that for this group the activity rate is rather small) and ME groups. The last column of Table 6.1 presents the numbers for the unemployment rate – i.e. unemployed/(employed + unemployed). From these figures we can see that the unemployment rate is highest for the LE group, ranging from about 10% to more than 30%. Exceptions are Romania, with a particularly low rate, about 8%, for the LE (the reason for this is the high share of agricultural employment) and the Slovak Republic with a rate of more than 40%. The unemployment rates for the HE are much lower, between about 3% and 10%; those for the ME are in between.

Table 6.1

Structure of working-age population (15-64) by working status and educational attainment levels, 2002

		Absolute numbers (in 1000)				in % of total				Unemployment
		Total	Employed	Inactive	Unemployed	Employed	Unemployed	Active	Inactive	Rate
CZ	**LE**	1347	350	906	91	26.0	6.7	32.7	67.3	20.6
	ME	5093	3721	1119	253	73.1	5.0	78.0	22.0	6.4
	HE	701	605	85	11	86.3	1.6	87.9	12.1	1.8
		7141	*4676*	*2110*	*355*	*65.5*	*5.0*	*70.5*	*29.5*	*7.1*
EE	**LE**	196	52	131	13	26.6	6.6	33.3	66.7	20.0
	ME	496	334	124	38	67.4	7.7	75.1	24.9	10.3
	HE	220	177	35	9	80.1	4.0	84.1	15.9	4.7
		913	*563*	*290*	*60*	*61.7*	*6.6*	*68.3*	*31.7*	*9.6*
HU	**LE**	2211	633	1497	82	28.6	3.7	32.3	67.7	11.4
	ME	3828	2551	1141	136	66.6	3.6	70.2	29.8	5.1
	HE	810	663	135	12	81.8	1.5	83.3	16.7	1.8
		6850	*3847*	*2773*	*230*	*56.2*	*3.4*	*59.5*	*40.5*	*5.6*
LT	**LE**	553	145	374	34	26.2	6.2	32.4	67.6	19.2
	ME	1316	895	269	152	68.0	11.6	79.6	20.4	14.5
	HE	432	356	51	26	82.3	6.0	88.3	11.7	6.8
		2301	*1395*	*694*	*212*	*60.6*	*9.2*	*69.9*	*30.1*	*13.2*
LV	**LE**	411	133	236	42	32.4	10.2	42.6	57.4	24.0
	ME	920	619	208	92	67.3	10.0	77.4	22.6	13.0
	HE	259	209	35	15	80.7	5.7	86.4	13.6	6.6
		1590	*961*	*479*	*149*	*60.5*	*9.4*	*69.8*	*30.2*	*13.4*
PL	**LE**	6733	1684	4389	660	25.0	9.8	34.8	65.2	28.1
	ME	16793	9701	4477	2615	57.8	15.6	73.3	26.7	21.2
	HE	2579	2124	305	150	82.4	5.8	88.2	11.8	6.6
		26105	*13509*	*9171*	*3425*	*51.7*	*13.1*	*64.9*	*35.1*	*20.2*
SI	**LE**	375	157	202	16	41.8	4.3	46.1	53.9	9.4
	ME	837	581	218	37	69.5	4.5	74.0	26.0	6.1
	HE	163	141	19	4	86.4	2.2	88.6	11.4	2.5
		1375	*879*	*439*	*57*	*63.9*	*4.2*	*68.1*	*31.9*	*6.1*
SK	**LE**	779	121	555	104	15.5	13.3	28.8	71.2	46.1
	ME	2628	1710	548	371	65.0	14.1	79.1	20.9	17.8
	HE	321	275	34	11	85.8	3.5	89.4	10.6	3.9
		3729	*2106*	*1137*	*485*	*56.5*	*13.0*	*69.5*	*30.5*	*18.7*
BG	**LE**	1811	498	1093	220	27.5	12.1	39.6	60.4	30.6
	ME	2647	1550	764	334	58.5	12.6	71.1	28.9	17.7
	HE	941	712	165	64	75.7	6.8	82.5	17.5	8.2
		5400	*2760*	*2022*	*617*	*51.1*	*11.4*	*62.5*	*37.5*	*18.3*
RO	**LE**	5334	2338	2803	193	43.8	3.6	47.5	52.5	7.6
	ME	8746	5623	2497	626	64.3	7.2	71.5	28.5	10.0
	HE	1236	1014	179	43	82.0	3.5	85.5	14.5	4.1
		15315	*8974*	*5479*	*862*	*58.6*	*5.6*	*64.2*	*35.8*	*8.8*
EU-15	**LE**	91376	45066	40847	5462	49.3	6.0	55.3	44.7	*10.8*
	ME	104430	73636	24980	5814	70.5	5.6	76.1	23.9	*7.3*
	HE	46554	38553	6143	1858	82.8	4.0	86.8	13.2	*4.6*
		242359	*157255*	*71970*	*13135*	*64.9*	*5.4*	*70.3*	*29.7*	*7.7*

Source: LFS statistics; own calculations.

6.2 Supply-side projections

We now turn to the supply-side projections for which the results are discussed below. These projections have been carried out by Terry Ward and Pawel Gajewski and the assumptions on which these supply forecasts are based and the methodology for these projections are summarized in Box 6.1.[12]

Box 6.1

Population projections (Terry Ward)

It is possible to estimate working-age population in the new EU member states over the next ten years on the basis of United Nations demographic forecasts. This enables some indication to be gained of the implied change in employment rates over this period given the projected growth of the number employed, based on our scenarios of output change and productivity growth. Further than this, the same population projections can be used in combination with projections of educational attainment levels of people in different age groups to generate estimates of the number of people of working age with different levels of education. These can then be compared with the projections of the demand for labour with different education levels based on the scenarios to gain an idea of potential skill mismatches – as indicated by the relative movement in supply and demand for labour with given levels of education, which is captured by the change in the employment rate for such people.

The projections of educational attainment levels of working-age population (15-64) are generated on the assumption, first, that the attainment level of men and women – who are separately distinguished – does not change after they reach 30, i.e. that they do not acquire additional educational qualifications after this age (which seems to accord with reality except in very rare cases). This fixes the education levels of men and women in particular age cohorts as they grow older – i.e. the education level of those aged 40-44 in ten years' time is assumed to be the same as those aged 30-34 at present (the projections are made by taking 5-year age groups as the basis).

The future education levels of those below the age of 30 are projected on the basis of recent trends, to the extent that any are evident. In the case of those aged 15-19 and 20-24, i.e. those who to a large extent are still participating in initial education and training, there is little sign of any systematic change in any of the countries in the proportion with different levels of education over the past five years. In consequence, the proportions observed in 2003 (the base year of the projections) for men and women in these two age groups are assumed to apply to the same age groups in future years. In the case of those aged 25-29, an increase in education levels, in the form mainly of a rise in the proportion with high or tertiary education, is evident in most countries over the past five years and this is assumed to continue in the future.

This upward trend tends to mean that educational attainment levels of working-age population are projected to be higher in future years than at present. The increase implied for the 15-64 age group as a whole as a result of this, however, is relatively small over the next ten years. The main source of increase is the process of ageing itself coupled with the long-term rise in the participation of young

[12] These projections have been carried out by Pawel Gajewski and Terry Ward (Alphametrics, Cambridge, UK). The author is grateful for the provision of these data.

people in education. Those who reach 65 and are no longer part of working-age population, therefore, tend to have significantly lower education levels than those leaving the education system at the other end of the scale. In other words, those who reach retirement age and are no longer part of the potential labour force typically include more people with low education – and fewer with tertiary education – than those who remain and many more than in the case of the young people joining the labour force to replace them. For example, in the Czech Republic, almost 25% of those aged 60-64 in 2003 had low education (no education beyond basic schooling) as compared with under 7% of those aged 25-29 in the same year.

Nevertheless, over ten years, the relative numbers of people of working age with different levels of education are unlikely to change markedly, simply because most of the people of this age in 2003 will still be of working age in 2013, and the large majority of these, in turn, are unlikely to attain a higher level. In the Czech Republic, Hungary and Slovakia, therefore, the proportion of working-age population with tertiary education in 2013 is projected to be under 2 percentage points higher than in 2003. The same is the case in Romania, while in Poland, the projected increase over these ten years is only just over 2 percentage points. In the other countries, the increase in the proportion is larger, but only in Poland and Slovenia is the rise 4 percentage points or more.

The implication is that in 2013, the proportion of people of working age with tertiary education in most of the new member states will, on current trends, remain below the average in the EU-15 in 2003 (20%). In Poland, it is projected to be 4 percentage points below, in Hungary, over 5 percentage points and in the Czech Republic and Slovakia, over 8 percentage points. Only in Estonia and Lithuania will the proportion be above the 2003 level in the EU-15, and in the first, this is already the case.

In the two applicant countries, the proportion of people of working age with tertiary education is projected for Bulgaria to be much the same in 2013 as the EU-15 2003 average, though for Romania, still only around half the latter.

At the same time as this relatively modest increase in the relative number of working-age population with tertiary education, the proportion with only basic schooling is projected to fall even further. On current trends, there will be under 25% with that level of education in 2013 in all the new member states – the proportion in the EU-15 averaged 37% in 2003 – though the proportion would still be over 25% in Bulgaria and Romania (around 28% in both cases as against 34-36% in 2003). Indeed, in all but Hungary and Latvia, the relative number is projected to be below 20%.

In terms of the 25-64 age group, which excludes those with basic schooling undertaking upper secondary education programmes, the proportion is projected to be under 20% in ten years' time in all of these countries (the EU-15 average was 34% in 2003) and under 15% in most cases, with the figure declining to under 10% in the Czech Republic, Estonia and Slovakia. The key question which remains in this regard is how far those with education beyond basic schooling, the great majority of whom will have left the education system without progressing on to university, will have completed education or training programmes which prepare them for the pursuit of a working career, given labour market needs in economies undergoing continuing restructuring.

In Table 6.2 we present these supply-side forecasts in levels, shares and growth rates resulting from this exercise. Some of the results and potential problems have already been summarized in Box 6.1 above. Let us highlight some further issues which are important when comparing them to the demand-side forecasts.

Let us first mention that total working-age population (i.e. 15-64) is shrinking in almost all countries. The only exceptions are the Slovak Republic and Poland. In these countries, however, total working-age population starts shrinking in the second period, 2008-2013. A second important fact suggested by this exercise is that the number of highly educated (HE) is increasing at partly high rates over the period. This is especially the case for Poland where the average growth rate is nearly almost 4% p.a. For the medium-educated, the forecasts are mixed for the particular countries; the (absolute) rates of change are however much lower as compared to changes in the other two skill groups. Finally, the number of people with low education is shrinking partly dramatically. The growth rates are about -2% to -4% p.a. Potential explanations for this change in the educational structures are that, first, the cohorts leaving the working-age population are generally less highly educated than the younger people entering the labour market, second, that high unemployment rates may induce people to go or stay longer in education, and third, there may be institutional changes in the educational structure (e.g. the opening-up of private universities, the supply of evening and weekend arrangements, etc.) which enable people to attain higher educational levels. Although these may be transitory effects, it has an impact on the skill structure of the labour force for the near future.[13] However, these effects might be overestimated in the supply forecasts above; that is why we partly undertake some adjustments to these supply-side forecasts when comparing them to the demand forecasts.

[13] The author is grateful to Pawel Gajewski for discussion on these issues.

Table 6.2

Supply-side projections

		Supply			Supply in % of total			Growth rates of supply			Growth rates of demand		
		2003	2008	2013	2003	2008	2013	2003-2008	2008-2013	2003-2013	2002-2007	2007-2012	2002-2012
CZ	**LE**	1317	1168	990	18.4	16.3	14.3	-2.39	-3.32	-2.86	-0.22	0.17	-0.02
	ME	5142	5225	5127	71.7	72.9	74.0	0.32	-0.38	-0.03	0.33	0.70	0.51
	HE	708	771	813	9.9	10.8	11.7	1.70	1.06	1.38	1.41	1.62	1.52
		7167	7165	6930	100.0	100.0	100.0	-0.01	-0.67	-0.34	0.44	0.79	0.61
EE	**LE**	193	162	134	21.2	18.6	15.4	-3.48	-3.78	-3.63	-0.75	-0.25	-0.50
	ME	493	488	501	54.1	55.9	57.4	-0.19	0.52	0.17	-0.49	0.01	-0.24
	HE	226	223	238	24.8	25.6	27.3	-0.23	1.30	0.53	0.05	0.48	0.26
		911	873	873	100.0	100.0	100.0	-0.85	0.00	-0.43	-0.34	0.14	-0.10
HU	**LE**	2071	1765	1569	30.3	26.2	23.9	-3.20	-2.36	-2.78	-0.41	0.00	-0.20
	ME	3886	4043	4035	56.9	60.1	61.6	0.79	-0.04	0.38	0.22	0.62	0.42
	HE	879	924	947	12.9	13.7	14.5	1.01	0.48	0.75	1.13	1.41	1.27
		6835	6732	6551	100.0	100.0	100.0	-0.30	-0.55	-0.43	0.28	0.67	0.48
LT	**LE**	527	472	424	22.9	20.9	19.2	-2.21	-2.15	-2.18	-2.40	-1.82	-2.11
	ME	1321	1314	1263	57.5	58.1	57.3	-0.10	-0.80	-0.45	-1.00	-0.47	-0.74
	HE	451	475	516	19.6	21.0	23.4	1.04	1.66	1.35	-0.03	0.39	0.18
		2299	2261	2203	100.0	100.0	100.0	-0.33	-0.52	-0.43	-0.89	-0.36	-0.63
LV	**LE**	421	371	318	26.5	24.1	21.8	-2.50	-3.11	-2.81	-2.44	-1.82	-2.13
	ME	928	921	883	58.5	59.9	60.5	-0.15	-0.84	-0.50	-1.24	-0.69	-0.97
	HE	239	245	259	15.0	15.9	17.7	0.48	1.13	0.81	-0.69	-0.16	-0.43
		1588	1537	1460	100.0	100.0	100.0	-0.65	-1.03	-0.84	-1.29	-0.71	-1.00
PL	**LE**	6445	5538	4731	24.8	20.8	17.8	-3.04	-3.15	-3.09	-2.41	-1.80	-2.11
	ME	17736	17111	17589	68.1	64.4	66.2	-0.72	0.55	-0.08	-0.36	0.12	-0.12
	HE	2947	3594	4232	11.3	13.5	15.9	3.97	3.27	3.62	0.87	1.14	1.01
		26041	26563	26552	100.0	100.0	100.0	0.40	-0.01	0.19	-0.42	0.08	-0.17
SI	**LE**	362	314	270	25.8	22.5	19.9	-2.84	-2.98	-2.91	-1.14	-0.64	-0.89
	ME	840	850	840	59.9	61.0	61.7	0.23	-0.24	-0.01	0.56	0.96	0.76
	HE	202	229	250	14.4	16.4	18.4	2.48	1.79	2.14	1.56	1.77	1.67
		1404	1392	1360	100.0	100.0	100.0	-0.17	-0.47	-0.32	0.43	0.84	0.63
SK	**LE**	773	665	557	20.7	17.5	14.7	-3.01	-3.53	-3.27	-0.43	-0.05	-0.24
	ME	2611	2751	2810	69.9	72.3	74.2	1.05	0.43	0.74	0.05	0.49	0.27
	HE	350	388	421	9.4	10.2	11.1	2.08	1.63	1.86	1.27	1.58	1.42
		3733	3804	3789	100.0	100.0	100.0	0.37	-0.08	0.15	0.19	0.61	0.40
BG	**LE**	1829	1598	1385	34.4	30.8	28.0	-2.70	-2.86	-2.78	-3.70	-3.05	-3.38
	ME	2554	2613	2565	48.1	50.3	51.8	0.45	-0.37	0.04	-2.03	-1.35	-1.69
	HE	929	982	1003	17.5	18.9	20.2	1.10	0.43	0.76	-0.69	-0.17	-0.43
		5312	5192	4953	100.0	100.0	100.0	-0.46	-0.94	-0.70	-2.13	-1.44	-1.79
RO	**LE**	5387	4719	4174	36.1	31.7	28.4	-2.65	-2.46	-2.55	-4.51	-3.92	-4.21
	ME	8352	8849	9111	55.9	59.4	62.0	1.16	0.58	0.87	-1.48	-0.81	-1.15
	HE	1190	1327	1409	8.0	8.9	9.6	2.17	1.20	1.69	0.64	1.01	0.83
		14929	14896	14694	100.0	100.0	100.0	-0.04	-0.27	-0.16	-2.12	-1.37	-1.75

Source: Projections calculated by Terry Ward and Pawel Gajewski.

6.3 Potential supply and demand mismatches

6.3.1 Employment rates

The supply projections can be compared with the demand projections for educational attainment levels. In a first step one can compare the average growth rates of supply and demand for each of the educational groups and for total employment. These growth rates are also reported in Table 6.2. For the more advanced countries (Czech Republic, Hungary, Slovenia, Slovak Republic and also Estonia) the growth rate of supply is lower than the growth rate of demand over this period, reflecting the changes in the supply side of the economies (i.e. the demographic effects). This is also the case for the LE employees in all countries with the exception of the CC-2, whereas for the ME no clear pattern emerges; finally, for the HE the growth rate of demand is higher than that of supply only in the Czech Republic and Hungary. This shows that supply-side changes are important factors that have to be taken into account when assessing the labour market effects of catching up and structural change.

Table 6.3

Potential mismatches in demand and supply by education

		Supply			Demand			Employment Rate		
		2002	**2007**	**2012**	**2002**	**2007**	**2012**	**2002**	**2007**	**2012**
CZ	**LE**	1347	1195	1012	350	346	349	26.0	29.0	34.5
	ME	5093	5175	5078	3721	3783	3917	73.1	73.1	77.1
	HE	701	763	805	605	649	704	86.3	85.1	87.5
	Total	7141	7134	6895	*4676*	*4779*	*4972*	*65.5*	*67.0*	*72.1*
EE	**LE**	196	165	137	52	50	50	26.6	30.5	36.4
	ME	496	491	504	334	326	326	67.4	66.4	64.7
	HE	220	218	232	177	177	181	80.1	81.3	78.0
	Total	913	874	873	*563*	*553*	*557*	*61.7*	*63.3*	*63.8*
HU	**LE**	2211	1885	1675	633	620	620	28.6	32.9	37.0
	ME	3828	3983	3975	2551	2580	2661	66.6	64.8	67.0
	HE	810	852	873	663	702	753	81.8	82.3	86.2
	Total	6850	6720	6523	*3847*	*3902*	*4035*	*56.2*	*58.1*	*61.9*
LT	**LE**	553	495	445	145	128	117	26.2	25.9	26.3
	ME	1316	1310	1258	895	851	832	68.0	65.0	66.1
	HE	432	455	495	356	355	362	82.3	78.0	73.2
	Total	2301	2260	2198	*1395*	*1335*	*1311*	*60.6*	*59.1*	*59.6*
LV	**LE**	411	362	310	133	118	107	32.4	32.5	34.6
	ME	920	913	875	619	582	562	67.3	63.7	64.2
	HE	259	266	281	209	202	201	80.7	76.1	71.3
	Total	1590	1541	1466	*961*	*901*	*870*	*60.5*	*58.5*	*59.3*
PL	**LE**	6733	5870	5100	1684	1493	1364	25.0	25.4	26.8
	ME	16793	16413	17109	9701	9528	9587	57.8	58.1	56.0
	HE	2579	2848	3091	2124	2218	2348	82.4	77.9	76.0
	Total	26105	25131	25299	*13509*	*13226*	*13278*	*51.7*	*52.6*	*52.5*
SI	**LE**	375	326	281	157	148	144	41.8	45.5	51.2
	ME	837	846	836	581	598	627	69.5	70.7	75.0
	HE	163	185	202	141	152	167	86.4	82.5	82.4
	Total	1375	1357	1319	*879*	*898*	*936*	*63.9*	*66.2*	*71.0*
SK	**LE**	779	670	562	121	118	118	15.5	17.7	21.0
	ME	2628	2770	2829	1710	1714	1756	65.0	61.9	62.1
	HE	321	356	386	275	293	317	85.8	82.4	82.2
	Total	3729	3796	3778	*2106*	*2126*	*2192*	*56.5*	*56.0*	*58.0*

(Table 6.3 contd.)

Table 6.3 (continued)

BG	**LE**	1811	1583	1372	498	414	355	27.5	26.2	25.9
	ME	2647	2708	2659	1550	1400	1309	58.5	51.7	49.2
	HE	941	994	1015	712	688	682	75.7	69.2	67.2
	Total	5400	5285	5046	*2760*	*2481*	*2309*	*51.1*	*47.0*	*45.8*
RO	**LE**	5334	4673	4133	2338	1866	1534	43.8	39.9	37.1
	ME	8746	9267	9541	5623	5222	5014	64.3	56.4	52.6
	HE	1236	1378	1463	1014	1047	1101	82.0	76.0	75.3
	Total	15315	15317	15137	*8974*	*8072*	*7536*	*58.6*	*52.7*	*49.8*

Note: Assumed GDP growth 4%.

In the following we compare the demand projections for two scenarios (GDP growth rate of 4% and 5%, respectively) to our supply forecasts. As the supply projections are provided for 2008 and 2013 only, whereas the demand projections relate to 2007 and 2012, we had to make several adjustments. First, we used the growth rates of the supply projections for the period 2003-2008 and 2008-2013 and assumed these to be the growth rates for the two five-year periods starting from 2002; thus the supply- and demand-side projections are started in the same year. Second, in the case of Poland we adjusted the supply growth rates for the highly educated persons; specifically, instead of 4% for the period 2002-2007 we used only 2%, and instead of 3.3% we used 1.1% for reasons discussed above. To keep total population constant, we allocated the difference to the LE and ME according to their shares in total population. Third, for 2002 there are small differences with respect to employment levels in the initial year as for the demand forecasts we used the SNA data, which may not match the LFS data.[14] For this reason we adjusted the level of demand to the level of supply in 2002 and used the growth rates reported in Table 6.2 (with the adjustment for Poland) on demand for recalculating the demand projections. After these steps we are able to compare the supply with the demand forecasts; these comparisons are reported in Table 6.3.

In this table we report the recalculated supply forecasts, the (level-) adjusted demand forecasts (with 4% GDP growth rate) and the employment rates for 2002, 2007 and 2012. Appendix Table A.8 provides the same information under the assumption of a GDP growth rate of 5% per year. First, there is a group of countries where the employment rate is rising. These are the more successful economies: the Czech Republic, Hungary and Slovenia, where the employment rate is rising between 5 and 10 percentage points. In Estonia, Latvia, Poland and the Slovak Republic, the employment rate remains more or less constant. In the remaining countries (Lithuania, Bulgaria and Romania) it is falling dramatically, to a rate about 10 percentage points below the level in 2002. Of course, this fall is less dramatic when assuming a higher GDP growth rate; in this case the employment

[14] Apart from the fact that different sources may be used for the SNA data, other problems are e.g. that the SNA include people of higher age than 64, that people in the LFS who cannot be related to a specific skill group or occupation (i.e. the category 'No Answer') have been dropped from our sample, etc. The differences are relatively large for Estonia, Latvia, Lithuania and Slovenia (for these mainly for ME) and for the LE in the CC-2 and Poland.

rate for the CC-2 remains nearly constant in Bulgaria and drops from 58.6% to 55% in Romania (see Table A.8). However, there are differences among the particular skill groups. The employment rate for the low-educated is rising in the Czech Republic, Estonia, Hungary, Slovenia and the Slovak Republic, remains constant in Lithuania, Latvia, Poland and Bulgaria, and is falling only in Romania, which reflects the decline of supply. Only in the latter country, Romania, which shows the highest initial share in agricultural employment, is the decline in supply less strong than the decline in demand. For the medium-educated the tendencies are less clear and the magnitudes are lower; in general, the employment rates are rising in the more successful countries and declining in Romania and Bulgaria; however, for this latter group the employment rates are almost stable when assuming a higher GDP growth rate (see Appendix Table A.8). Finally, as supply of the highly educated is rising in all countries, the employment rates are more likely to be declining. The rates are more or less constant in the Czech Republic and Estonia, rising in Hungary, and falling in all other countries, which reflects the increase in demand. Under the assumption of a higher GDP growth rate, all countries with the exceptions of Latvia and Lithuania even show a rising or at least more or less constant employment rate (especially Romania and Bulgaria).

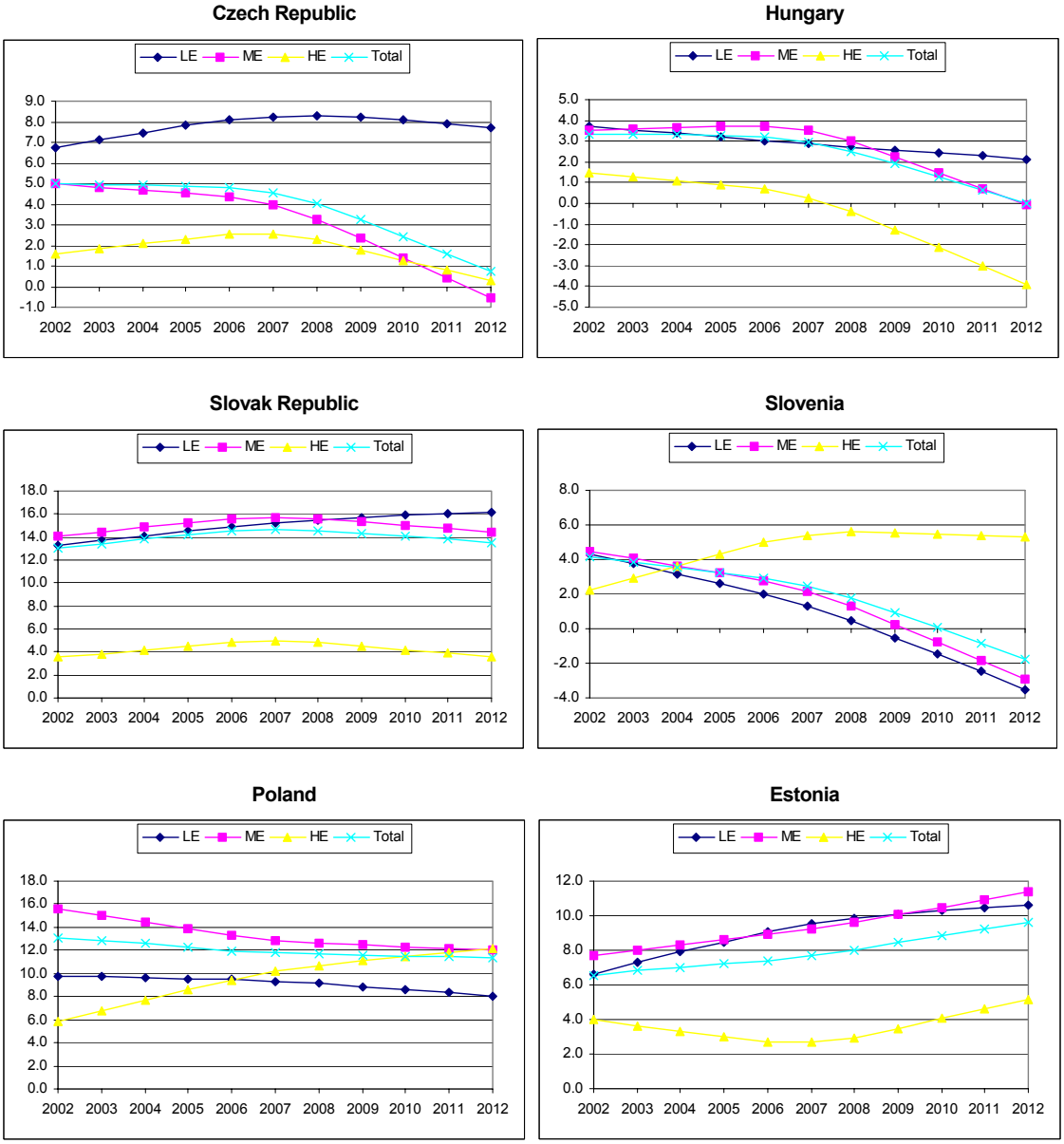
6.3.2 Labour market performance and unemployment rate scenarios

Finally, these figures can be used to calculate scenarios of the dynamics of future unemployment rates by educational groups in these countries. This, in addition, requires projections of future participation rates: for this purpose we assumed that for each age cohort (15-19, 20-24, ..., 60-64) the activity rates by gender are constant. As the supply forecasts include data by educational level, age cohorts and gender, we can calculate average activity rates of the educational groups in the two five-year periods. We further assumed that the activity rates are adjusting gradually (linear) to the projected activity rates. Further, these calculations may be biased as for the younger age cohorts more people are in education, which is particularly the case for the last few years. That is why we calculated a second scenario for which we take only the age cohorts from 20-24, etc. into account. These latter calculations imply in general higher participation rates especially for the low-educated, which on the other hand may even overestimate participation. These two estimates thus provide upper and lower scenarios which we used in the following way: For the countries showing a positive general trend in employment, i.e. the Czech Republic, Hungary, Slovenia, the Slovak Republic and also Estonia, we calculated the average participation rate as an average of the two scenarios. This especially implies that the participation rates of the low-educated are rising over time – which is reasonable as these rates declined dramatically in the years of transition and are quite low compared to the EU-15 average. For the remaining countries we only used the first scenario, which implies a lower dynamics in the participation rates of the low-educated. In all cases the highly educated show a tendency of falling participation rates, which shows the effects of a higher participation in education and also reflects gender-

specific effects.[15] Let us note that these calculations are rather mechanical and, in particular, do not take account of specific supply elasticities which may be vary according to rising or falling employment and – in our case – especially in cases when supply of some groups may become scarce (in this case the above procedure may underestimate the supply elasticity, which results in negative unemployment rates). With these caveats in mind, let us now report the results, again for the two different scenarios with respect to assumptions of GDP growth (4% and 5%, respectively).

Figure 6.1a **Projections of the share of unemployed in total working-age population (15-64)**

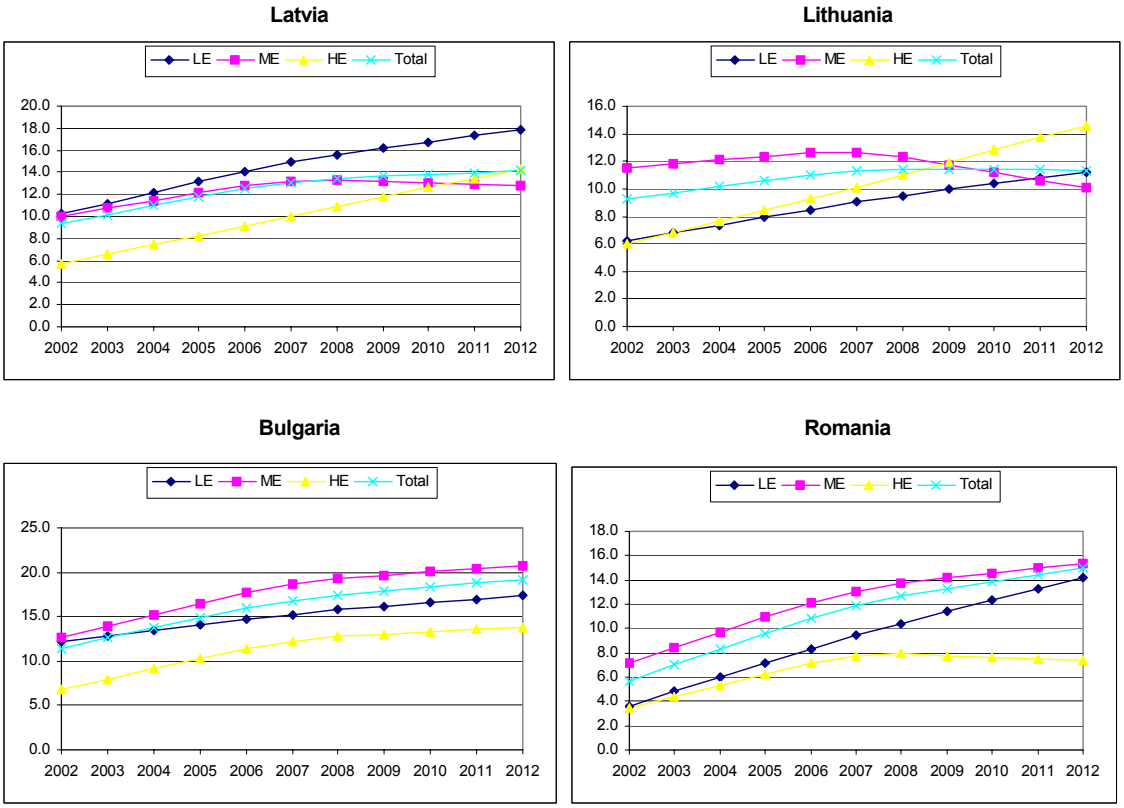
(percentage points)



(Figure 6.1a contd.)

[15] The exact numbers can be requested from the author.

Figure 6.1a (continued)



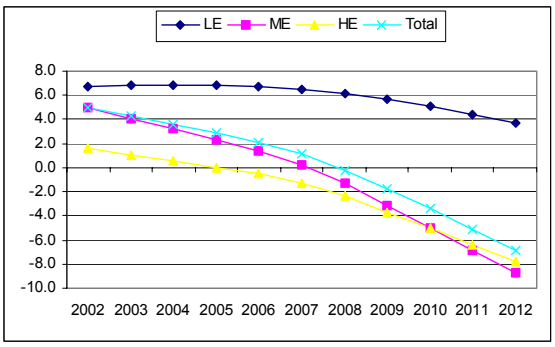
Note: Assumed GDP growth rate 4%.

From these figures we can see that in the more successful NMS, but also in Poland, the unemployment share is on a downward trend (an exception to this is the Slovak Republic where it is rising first and starts falling later). For the other countries we can see a rising share; the increase, however, starts to slow down in later years. Especially in the CC-2 the increase is particularly strong. However, when assuming a higher GDP growth rate (see Figure 6.1b) all countries with the exception of the CC-2 are on a downward trend and the CC-2 show a much more moderate increase (in Bulgaria from about 12% to 15% and in Romania from 6% to 10%) as this implies a much stronger increase (or a lower decrease) in demand. However, there are differences with respect to educational groups. Still, in most cases the structure of unemployment remains constant over time. Exceptions to this are the Czech Republic and, to a less degree, Latvia, where the share of unemployed low-educated people is increasing relative to overall unemployment. In Slovenia, Poland, Latvia and Lithuania, the share of unemployed of the highly educated is strongly increasing (relative to the overall share of unemployed) as these countries show particularly high growth rates of this part of the population. These patterns are similar also when assuming a GDP growth rate of 5% per year.

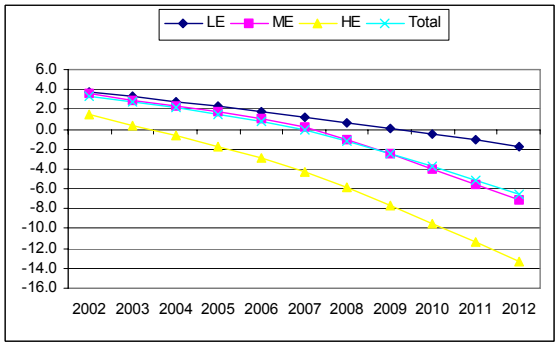
Figure 6.1b **Projections of the share of unemployed in total working-age population (15-64)**

(percentage points)

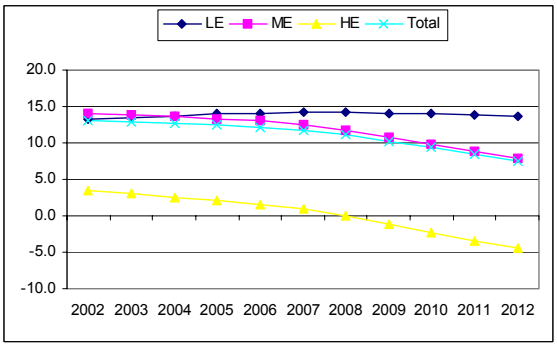
Czech Republic



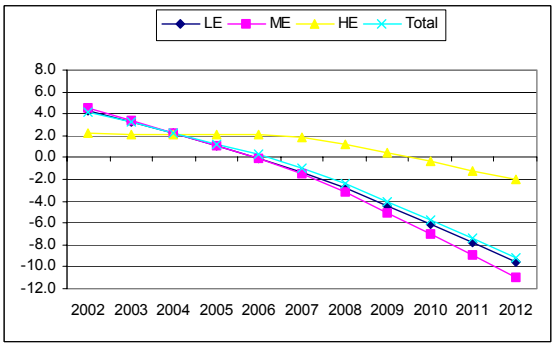
Hungary



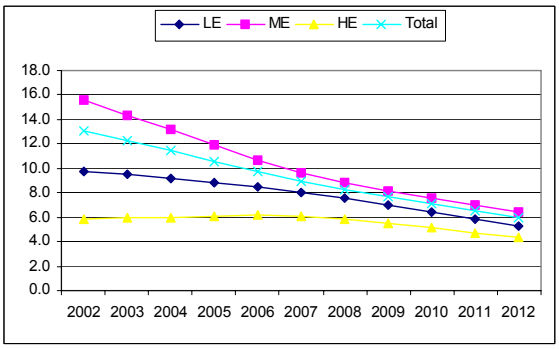
Slovak Republic



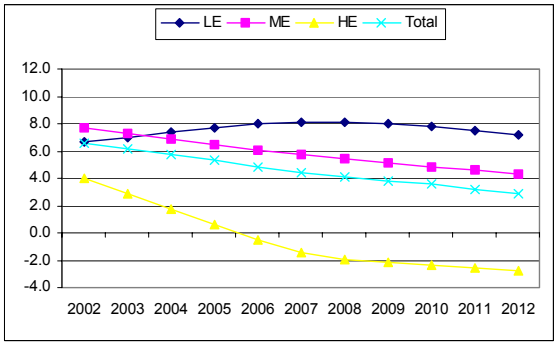
Slovenia



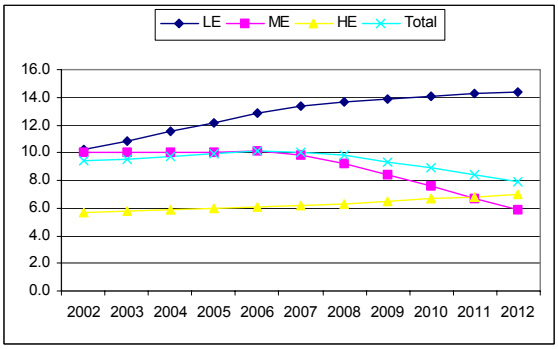
Poland



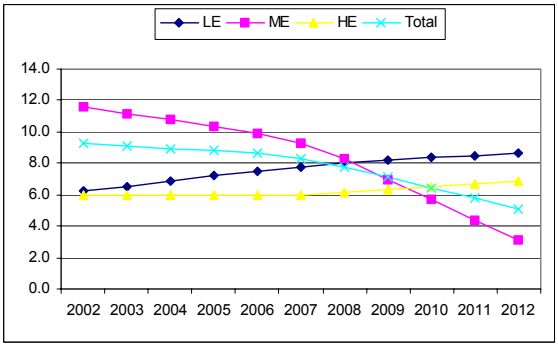
Estonia



Latvia

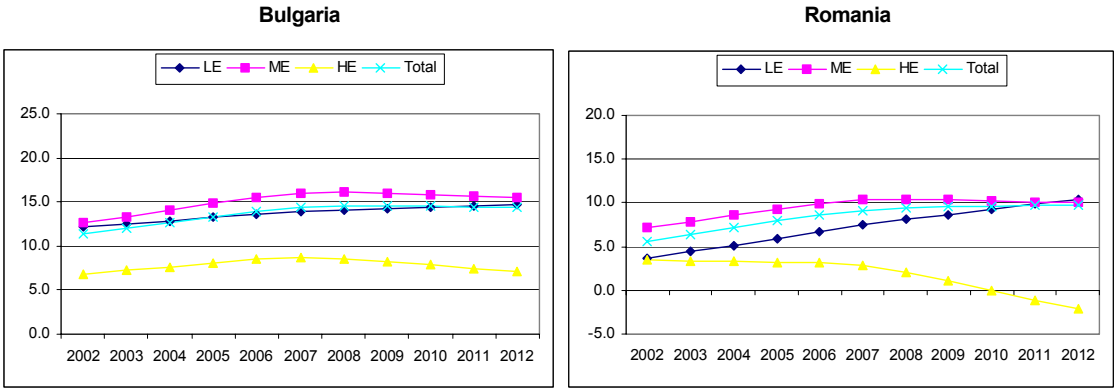


Lithuania



(Figure 6.1b contd.)

Figure 6.1b (continued)



Note: Assumed GDP growth rate 5% per year.

What does this mean in terms of unemployment rates? In Figure 6.2 we have plotted the unemployment rates for these two scenarios of GDP growth in 2002 and 2012. Unemployment rates in the advanced NMS are falling or are at least constant, whereas they are rising in the Baltics and sharply rising in the CC-2. In Panel b of Figure 6.2 we can see that for the latter two countries, a GDP growth rate higher by one percentage point has a strong positive impact as unemployment rates are rising less, though they still reach a high level according to European standards. In this scenario the more advanced economies would even enter a stage of labour scarcity; but one should note again that this also depends heavily on the participation rates underlying these figures. Finally, we can see from these figures that the structure of unemployment rates by educational groups remains similar over time; this means in particular that the low-educated people experience the highest unemployment rates in general.

This concludes the presentations of the potential labour market developments in the NMS and CC-2 based on a model of productivity convergence and structural change modelled via convergence in the sectoral structure. In this last section we also introduced supply-side dynamics mainly driven by demographic forces and changes in the availability of educational facilities. Let us now come to a summary of the findings.

7 Conclusions

This paper introduced a framework for forecasting employment levels and structures by sectors, occupations and educational attainments. The framework is based on the idea that countries characterized by lower productivity levels have a higher potential for productivity growth and thus converge to the levels of the technological leaders (which is similar to the convergence processes formalized in the growth literature and has already been argued by Alexander Gerschenkron's idea of the 'advantage of backwardness'). The

same convergence process was assumed for sectoral shares in value added. As productivity levels are converging, the real income levels of the follower countries get closer to that of the leader countries, which then results in similar expenditure structures (i.e. the income effects on demand structures are important). For an application of this framework we estimated aggregate and sectoral convergence parameters for productivity levels and value added shares. Given the initial values for the NMS and CC-2, the variables can be forecasted. These variables together with an assumed total GDP growth then allow for forecasting levels of employment. This framework was then also extended for an analysis of the structural developments with respect to occupational categories and demand for educational attainments. Finally, these demand projections for educational groups are linked to supply projections.

The main results according to the scenarios may be summarized as follows:

- In terms of aggregate employment levels, the more advanced NMS (Slovenia, Czech Republic, Slovak Republic, Hungary) are already, or will be in the next few years, in a phase of rising employment levels, although not at very high rates (i.e. unemployment rates or inactivity rates remain quite high). Another group of countries, i.e. Poland and the Baltic states, do not show rising employment but show a modest decrease in employment levels with structural adjustments taking place mainly due to the high share of employment in agriculture. Finally, Bulgaria and Romania face a severe decline of employment levels in the next decade (about 15% of employment in 2002) mainly caused by high productivity increases (due to the large gap) and the high initial share of agriculture.
- The structural shifts in employment patterns are very similar across countries, with shifts towards lower shares in agriculture and industry and higher shares in the services sectors.
- With respect to occupational categories, the group suffering most from the ongoing restructuring are the blue-collar high-skilled and blue-collar low-skilled workers. For the first group a decline in demand is predicted in all countries; for the latter group, decreasing demand is predicted in all countries except the Czech Republic, Hungary and the Slovak Republic. Demand for the other groups are in most cases rising or at least stable. However, demand is also declining for the blue-collar low-skilled workers in Slovenia.
- With respect to educational attainment groups, a clear picture emerges: the group suffering most in relative terms are the low-educated employees. Demand for this group is almost stable in the Czech Republic, Hungary and the Slovak Republic and modestly decreasing in Slovenia and Estonia. A strong decrease in demand for the low-educated persons is predicted for the other countries whereas demand for the other groups (medium-educated and highly educated) remains more or less stable or is even increasing.

- In the final section we have shown the importance of changes in the supply side, which are especially important for the low- and highly educated. The supply of low-educated is falling quite rapidly and in some cases even faster than demand, implying higher employment rates for this group despite the poor performance on the demand side. For the highly educated the opposite trend can be seen for some countries: supply is rising even faster than demand. Under particular assumptions on the participation rates we finally discussed the labour market performance of these countries with respect to the share of unemployed in total working-age population and concerning the unemployment rates under two different scenarios with respect to the GDP growth rate.

Of course, the scenarios depend on the assumptions with respect to convergence processes, total GDP growth etc. Thus further research has to tackle potential caveats of this approach and to undertake a number of sensitivity analyses with respect to the various assumptions. Let us mention some of the adjustments which seem reasonable to include in further research:

- The model sketched in section 2 allows for a much wider range of potential convergence trajectories (e.g. by introducing the learning parameter) and would even allow for falling behind if the initial gap is too large. This was not yet used in this paper. Similarly, one could allow for e.g. an S-shaped pattern of technological catching-up. Thus one potential extension is to allow for different convergence patterns of productivity.
- In the framework used so far we have not allowed for comparative advantage structures, which would imply different sectoral output shares in the longer run. Such comparative advantage structures could arise because of endowments with natural resources (e.g. tourism), human capital stock, path-dependent structures (i.e. agglomeration effects such as the automobile cluster), etc. Such structural aspects can be taken into account in the model by assuming 'target' levels for sectoral value added shares. Similarly, we have assumed that the share of the public sector becomes equal across countries over time. This may not be the case as the NMS may not converge to the 'typical' welfare state structure as the EU-15 countries. This can be taken into account by assuming different 'target' levels for this sector. In two sensitivity analyses we have recalculated the model under the assumption that there is no convergence in output shares of the manufacturing or the public services sectors (i.e. we have set the convergence parameter to zero). These scenarios yielded slightly different employment shares (higher shares of employment in manufacturing in the first sensitivity analysis and lower shares of employment in public services in the second sensitivity study). Further, there have been slight differences in the structure of demand by occupations and almost no differences in demand for educational attainment groups. Thus the scenarios are robust with respect to these modifications.
- We also assumed a constant and exogenous growth rate of GDP in the scenarios. Although the average growth rate over the next decade may be at this level, the

assumption that it is the same for all countries is not justified, as e.g. the initial shares differ (i.e. some countries have a higher initial share of sectors with above-average growth rates) and thus the aggregate growth rates may differ; also, the exposure to external markets is different (as e.g. some of the countries are already EU members, the CC-2 are not), the fiscal and monetary policies differ across countries, etc. Such considerations can be easily taken into account by recalculating the scenarios with different growth rates as was done in section 6, which shows that GDP growth is a crucial variable in future labour market developments.

- Finally, we have already mentioned that our calculations of supply and future participation rates are rather mechanical and the results should thus be interpreted with caution. Again, some more detailed sensitivity analyses are necessary to encounter the potential numerical effects of the particular assumptions.

Let us conclude that the model introduced here which allows to calculate scenarios of employment demand in levels, sectoral structures as well as by occupational and educational categories, yields interesting results and scenarios with respect to potential future labour market developments and in this way highlights the crucial variables in the partly painful adjustment processes. We have also emphasized potential caveats of this framework which should guide future research.

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Appendix

Table A.1

Sectoral breakdown

Code	Name	Code	Name
AB	Agriculture	A	Agriculture, hunting and forestry
		B	Fishing
CDE	Industry	C	Mining and quarrying
		D	Total manufacturing
		E	Electricity, gas and water
F	Construction	F	Construction
GH	Trade, repairs and hotels	G	Wholesale and retail trade; repairs
		H	Hotels and restaurants
I	Transport	I	Transport and storage communication
JK	Business services	J	Financial intermediation
		K	Real estate, renting and business activities
LQ	Public services	L	Public administration and defence; compulsory social security
		M	Education
		N	Health and social work
		O	Other community, social and personal services
		P	Private households with employed persons
		Q	Extra-territorial organizations and bodies

Table A.2

Country sample

Group	Country		
EU-15	AUT	11.A	Austria
	BEL	01.B	Belgium
	DEU	03.D	Germany
	DNK	02.DNK	Denmark
	FIN	13.FIN	Finland
	FRA	06.F	France
	GBR	15.UK	United Kingdom
	ITA	08.I	Italy
	LUX	09.L	Luxembourg
	NLD	10.NL	Netherlands
	SWE	14.S	Sweden
	NOR		Norway
	ESP	05.E	Spain
	GRC	04.EL	Greece
	PRT	12.P	Portugal
NMS	CZ	19.CZ	Czech Republic
	EE	20.EE	Estonia
	HU	24.HU	Hungary
	LT	23.LT	Lithuania
	LV	22.LV	Latvia
	PL	26.PL	Poland
	SI	27.SI	Slovenia
	SK	28.SK	Slovakia
CC-2	BG	29.BG	Bulgaria
	RO	30.RO	Romania

Table A.3

Occupational categories

Group	ISCO88-code	Description
BCLS	6	Skilled agricultural and fishery workers
	9	Elementary occupations
BCHS	7	Craft and related trade workers
	8	Plant and machine operators and assemblers
WCLS	5	Service workers and shop and market sales workers
WCMS	4	Clerks
WCHS	1	Legislators, senior officials and managers
	2	Professionals
	3	Technicians and associate professionals

Table A.4

Educational levels

Group	Description
LE	Low-educated
ME	Medium-educated
HE	High-educated

Table A.5

Results from scenarios and sectoral decomposition analysis

		VA Shares			Productivity			Employment shares		
		2002	2007	2012	2002	2007	2012	2002	2007	2012
CZ	AB	0.06	0.05	0.05	30132	37750	47314	0.05	0.04	0.04
	CDE	0.34	0.32	0.30	27982	36580	47171	0.31	0.27	0.23
	F	0.03	0.04	0.04	9861	11060	12368	0.09	0.10	0.11
	GH	0.18	0.18	0.18	27719	30379	33242	0.17	0.18	0.19
	I	0.11	0.11	0.11	36755	49021	64515	0.08	0.07	0.06
	JK	0.18	0.19	0.19	60228	62529	64478	0.08	0.09	0.11
	LQ	0.10	0.12	0.13	11355	14584	18271	0.24	0.25	0.26

	Total change in employment	Productivity effect	Output effect	Structural effect	Structure output effect	Productivity output effect	Productivity structure effect	Mixed effect
AB	-36206	-83086	112526	-26082	-12828	-40865	9472	4659
CDE	-291490	-597485	722407	-138467	-68103	-293863	56326	27703
F	130938	-86508	209943	42079	20696	-42548	-8528	-4194
GH	176971	-131828	390211	-13320	-6551	-64837	2213	1089
I	-70574	-158792	181503	-17865	-8787	-78099	7687	3781
JK	183125	-24105	179873	28142	13841	-11856	-1855	-912
LQ	209942	-426681	554383	315065	154961	-209856	-119265	-58659
Total	302706	-1508486	2350846	189552	93229	-741924	-53949	-26534

	Total change in employment	Productivity effect	Output effect	Structural effect	Structure output effect	Productivity output effect	Productivity structure effect	Mixed effect
AB	-0.08	-0.17	0.24	-0.05	-0.03	-0.09	0.02	0.01
CDE	-0.61	-1.25	1.51	-0.29	-0.14	-0.61	0.12	0.06
F	0.27	-0.18	0.44	0.09	0.04	-0.09	-0.02	-0.01
GH	0.37	-0.28	0.82	-0.03	-0.01	-0.14	0.00	0.00
I	-0.15	-0.33	0.38	-0.04	-0.02	-0.16	0.02	0.01
JK	0.38	-0.05	0.38	0.06	0.03	-0.02	0.00	0.00
LQ	0.44	-0.89	1.16	0.66	0.32	-0.44	-0.25	-0.12
Total	0.63	-3.16	4.92	0.40	0.20	-1.55	-0.11	-0.06

(in percentage of total employed in 2002 per year)

		VA Shares			Productivity			Employment shares		
		2002	2007	2012	2002	2007	2012	2002	2007	2012
HU	AB	0.06	0.05	0.05	22387	28851	37098	0.06	0.05	0.05
	CDE	0.30	0.29	0.28	28189	36812	47428	0.27	0.24	0.21
	F	0.05	0.05	0.06	19262	20909	22667	0.07	0.08	0.09
	GH	0.12	0.13	0.13	17383	19917	22687	0.18	0.19	0.20
	I	0.10	0.10	0.09	30510	41927	56581	0.08	0.07	0.06
	JK	0.19	0.19	0.20	59013	61494	63603	0.08	0.09	0.11
	LQ	0.18	0.19	0.19	17634	21104	24916	0.26	0.27	0.28

	Total change in employment	Productivity effect	Output effect	Structural effect	Structure output effect	Productivity output effect	Productivity structure effect	Mixed effect
AB	-50137	-95529	118480	-28998	-14262	-46983	11499	5655
CDE	-185748	-425494	515870	-75412	-37089	-209265	30591	15045
F	86087	-40707	133283	10672	5248	-20020	-1603	-788
GH	140794	-161173	339061	36891	18143	-79267	-8625	-4242
I	-68179	-142703	152317	-9460	-4653	-70184	4359	2144
JK	144609	-22234	151530	18962	9325	-10935	-1368	-673
LQ	121631	-293027	493099	62195	30588	-144115	-18177	-8940
Total	189058	-1180868	1903639	14848	7302	-580769	16676	8202

	Total change in employment	Productivity effect	Output effect	Structural effect	Structure output effect	Productivity output effect	Productivity structure effect	Mixed effect
AB	-0.13	-0.25	0.31	-0.07	-0.04	-0.12	0.03	0.01
CDE	-0.48	-1.10	1.33	-0.19	-0.10	-0.54	0.08	0.04
F	0.22	-0.11	0.34	0.03	0.01	-0.05	0.00	0.00
GH	0.36	-0.42	0.88	0.10	0.05	-0.20	-0.02	-0.01
I	-0.18	-0.37	0.39	-0.02	-0.01	-0.18	0.01	0.01
JK	0.37	-0.06	0.39	0.05	0.02	-0.03	0.00	0.00
LQ	0.31	-0.76	1.27	0.16	0.08	-0.37	-0.05	-0.02
Total	0.49	-3.05	4.92	0.04	0.02	-1.50	0.04	0.02

(in percentage of total employed in 2002 per year)

(Table A.5 contd.)

Table A.5 (continued)

		VA Shares			Productivity			Employment shares		
		2002	2007	2012	2002	2007	2012	2002	2007	2012
SK	AB	0.05	0.05	0.05	22002	28401	36574	0.06	0.05	0.05
	CDE	0.28	0.27	0.27	23055	30963	40865	0.30	0.26	0.23
	F	0.04	0.04	0.04	11301	12591	13991	0.08	0.09	0.10
	GH	0.16	0.16	0.16	24353	27021	29899	0.16	0.17	0.19
	I	0.10	0.10	0.10	35823	47975	63358	0.07	0.06	0.06
	JK	0.18	0.19	0.19	66806	68067	69118	0.07	0.08	0.10
	LQ	0.19	0.20	0.20	18713	22182	25981	0.25	0.27	0.27

	Total change in employment	Productivity effect	Output effect	Structural effect	Structure output effect	Productivity output effect	Productivity structure effect	Mixed effect
AB	-27536	-52357	64624	-15663	-7703	-25749	6241	3069
CDE	-126210	-279328	315203	-29369	-14444	-137374	12800	6295
F	52683	-33837	86559	13776	6775	-16641	-2648	-1302
GH	74356	-63071	167217	1006	495	-31018	-187	-92
I	-30038	-67103	75936	-6960	-3423	-33002	3025	1488
JK	76998	-4785	70379	9539	4691	-2353	-319	-157
LQ	66317	-151459	266268	24186	11895	-74488	-6766	-3328
Total	86571	-651939	1046186	-3485	-1714	-320626	12146	5973

	Total change in employment	Productivity effect	Output effect	Structural effect	Structure output effect	Productivity output effect	Productivity structure effect	Mixed effect
AB	-0.13	-0.25	0.30	-0.07	-0.04	-0.12	0.03	0.01
CDE	-0.59	-1.31	1.48	-0.14	-0.07	-0.65	0.06	0.03
F	0.25	-0.16	0.41	0.06	0.03	-0.08	-0.01	-0.01
GH	0.35	-0.30	0.79	0.00	0.00	-0.15	0.00	0.00
I	-0.14	-0.32	0.36	-0.03	-0.02	-0.16	0.01	0.01
JK	0.36	-0.02	0.33	0.04	0.02	-0.01	0.00	0.00
LQ	0.31	-0.71	1.25	0.11	0.06	-0.35	-0.03	-0.02
Total	0.41	-3.06	4.92	-0.02	-0.01	-1.51	0.06	0.03

(in percentage of total employed in 2002 per year)

		VA Shares			Productivity			Employment shares		
		2002	2007	2012	2002	2007	2012	2002	2007	2012
SI	AB	0.03	0.03	0.03	10381	14393	19774	0.09	0.08	0.06
	CDE	0.34	0.32	0.30	29902	38729	49547	0.33	0.29	0.25
	F	0.06	0.06	0.06	27505	29342	31287	0.06	0.07	0.08
	GH	0.14	0.15	0.15	24719	27389	30267	0.17	0.18	0.20
	I	0.08	0.08	0.08	34897	46932	62199	0.06	0.06	0.05
	JK	0.16	0.16	0.17	60088	62410	64377	0.08	0.09	0.11
	LQ	0.20	0.20	0.21	27036	30211	33672	0.21	0.23	0.25

	Total change in employment	Productivity effect	Output effect	Structural effect	Structure output effect	Productivity output effect	Productivity structure effect	Mixed effect
AB	-19334	-35019	36263	-4277	-2104	-17226	2032	999
CDE	-47615	-102653	127353	-24221	-11915	-50495	9604	4724
F	17639	-5783	23528	2091	1029	-2845	-253	-124
GH	34268	-24370	65404	4293	2112	-11988	-787	-387
I	-7166	-22344	25039	1353	665	-10991	-594	-292
JK	31890	-3976	29356	6082	2992	-1956	-405	-199
LQ	41937	-33207	82888	7179	3532	-16334	-1415	-696
Total	51619	-227352	389831	-7500	-3689	-111834	8182	4025

	Total change in employment	Productivity effect	Output effect	Structural effect	Structure output effect	Productivity output effect	Productivity structure effect	Mixed effect
AB	-0.24	-0.44	0.46	-0.05	-0.03	-0.22	0.03	0.01
CDE	-0.60	-1.30	1.61	-0.31	-0.15	-0.64	0.12	0.06
F	0.22	-0.07	0.30	0.03	0.01	-0.04	0.00	0.00
GH	0.43	-0.31	0.83	0.05	0.03	-0.15	-0.01	0.00
I	-0.09	-0.28	0.32	0.02	0.01	-0.14	-0.01	0.00
JK	0.40	-0.05	0.37	0.08	0.04	-0.02	-0.01	0.00
LQ	0.53	-0.42	1.05	0.09	0.04	-0.21	-0.02	-0.01
Total	0.65	-2.87	4.92	-0.09	-0.05	-1.41	0.10	0.05

(in percentage of total employed in 2002 per year)

(Table A.5 contd.)

Table A.5 (continued)

		VA Shares			Productivity			Employment shares		
		2002	2007	2012	2002	2007	2012	2002	2007	2012
EE	AB	0.05	0.05	0.04	15387	20550	27291	0.07	0.06	0.05
	CDE	0.25	0.24	0.24	20602	28106	37598	0.25	0.22	0.20
	F	0.08	0.08	0.08	24036	25811	27695	0.07	0.08	0.09
	GH	0.15	0.15	0.15	17860	20410	23195	0.18	0.19	0.21
	I	0.12	0.11	0.11	26092	36767	50675	0.09	0.08	0.07
	JK	0.20	0.21	0.21	46379	50487	54119	0.09	0.10	0.12
	LQ	0.15	0.16	0.17	11985	15261	18980	0.26	0.27	0.27

	Total change in employment	Productivity effect	Output effect	Structural effect	Structure output effect	Productivity output effect	Productivity structure effect	Mixed effect
AB	-7446	-12388	13970	-3486	-1715	-6094	1521	748
CDE	-21190	-47778	51992	-2320	-1141	-23503	1049	516
F	7834	-3762	14006	-431	-212	-1850	57	28
GH	10515	-17544	37518	-718	-353	-8630	165	81
I	-11780	-19352	19623	-3293	-1620	-9520	1598	786
JK	12315	-5464	18795	1310	644	-2688	-187	-92
LQ	5442	-40625	54225	12560	6179	-19984	-4629	-2277
Total	-4310	-146914	210130	3621	1781	-72268	-427	-210

	Total change in employment	Productivity effect	Output effect	Structural effect	Structure output effect	Productivity output effect	Productivity structure effect	Mixed effect
AB	-0.17	-0.29	0.33	-0.08	-0.04	-0.14	0.04	0.02
CDE	-0.50	-1.12	1.22	-0.05	-0.03	-0.55	0.02	0.01
F	0.18	-0.09	0.33	-0.01	0.00	-0.04	0.00	0.00
GH	0.25	-0.41	0.88	-0.02	-0.01	-0.20	0.00	0.00
I	-0.28	-0.45	0.46	-0.08	-0.04	-0.22	0.04	0.02
JK	0.29	-0.13	0.44	0.03	0.02	-0.06	0.00	0.00
LQ	0.13	-0.95	1.27	0.29	0.14	-0.47	-0.11	-0.05
Total	-0.10	-3.44	4.92	0.08	0.04	-1.69	-0.01	0.00

(in percentage of total employed in 2002 per year)

		VA Shares			Productivity			Employment shares		
		2002	2007	2012	2002	2007	2012	2002	2007	2012
PL	AB	0.06	0.06	0.05	6551	9490	13565	0.19	0.16	0.13
	CDE	0.31	0.30	0.29	29561	38349	49128	0.22	0.21	0.19
	F	0.06	0.06	0.06	20922	22620	24428	0.06	0.07	0.08
	GH	0.22	0.22	0.21	29933	32567	35401	0.16	0.18	0.19
	I	0.07	0.08	0.08	26311	37027	50975	0.06	0.05	0.05
	JK	0.10	0.11	0.12	30243	35574	40632	0.07	0.08	0.10
	LQ	0.17	0.18	0.19	15814	19260	23075	0.23	0.25	0.26

	Total change in employment	Productivity effect	Output effect	Structural effect	Structure output effect	Productivity output effect	Productivity structure effect	Mixed effect
AB	-964629	-1377415	1310220	-305349	-150177	-677442	157879	77648
CDE	-504524	-1233094	1522689	-209053	-102817	-606464	83263	40950
F	281141	-122115	418543	35039	17233	-60059	-5028	-2473
GH	420306	-340892	1085457	-124152	-61061	-167659	19176	9431
I	-167157	-402560	409198	31417	15452	-197988	-15201	-7476
JK	304383	-252876	486414	175809	86466	-124370	-44952	-22108
LQ	394778	-988083	1544330	317384	156096	-485961	-99873	-49119
Total	-235702	-4717035	6776850	-78906	-38807	-2319943	95264	46853

	Total change in employment	Productivity effect	Output effect	Structural effect	Structure output effect	Productivity output effect	Productivity structure effect	Mixed effect
AB	-0.70	-1.00	0.95	-0.22	-0.11	-0.49	0.11	0.06
CDE	-0.37	-0.89	1.11	-0.15	-0.07	-0.44	0.06	0.03
F	0.20	-0.09	0.30	0.03	0.01	-0.04	0.00	0.00
GH	0.31	-0.25	0.79	-0.09	-0.04	-0.12	0.01	0.01
I	-0.12	-0.29	0.30	0.02	0.01	-0.14	-0.01	-0.01
JK	0.22	-0.18	0.35	0.13	0.06	-0.09	-0.03	-0.02
LQ	0.29	-0.72	1.12	0.23	0.11	-0.35	-0.07	-0.04
Total	-0.17	-3.42	4.92	-0.06	-0.03	-1.68	0.07	0.03

(in percentage of total employed in 2002 per year)

(Table A.5 contd.)

Table A.5 (continued)

		VA Shares			Productivity			Employment shares		
		2002	2007	2012	2002	2007	2012	2002	2007	2012
LT	AB	0.09	0.08	0.08	8627	12174	16994	0.18	0.15	0.12
	CDE	0.28	0.28	0.27	23208	31140	41066	0.21	0.19	0.18
	F	0.06	0.06	0.06	15676	17188	18812	0.07	0.08	0.09
	GH	0.21	0.21	0.20	21267	23903	26759	0.17	0.19	0.20
	I	0.09	0.09	0.09	23959	34227	47720	0.06	0.06	0.05
	JK	0.10	0.11	0.12	34412	39542	44306	0.05	0.06	0.07
	LQ	0.17	0.18	0.18	10707	13882	17530	0.27	0.28	0.28

	Total change in employment	Productivity effect	Output effect	Structural effect	Structure output effect	Productivity output effect	Productivity structure effect	Mixed effect
AB	-99350	-134785	134657	-43464	-21380	-66296	21399	10526
CDE	-61841	-139335	157601	-13717	-6747	-68534	5965	2934
F	29370	-16973	50080	3712	1826	-8349	-619	-304
GH	33434	-53637	128531	-12709	-6251	-26383	2609	1283
I	-23927	-47542	46963	51	25	-23384	-25	-12
JK	27484	-16808	37023	13411	6597	-8268	-2995	-1473
LQ	1520	-158816	200696	41448	20388	-78116	-16133	-7935
Total	-93309	-567897	755551	-11268	-5543	-279330	10201	5018

	Total change in employment	Productivity effect	Output effect	Structural effect	Structure output effect	Productivity output effect	Productivity structure effect	Mixed effect
AB	-0.65	-0.88	0.88	-0.28	-0.14	-0.43	0.14	0.07
CDE	-0.40	-0.91	1.03	-0.09	-0.04	-0.45	0.04	0.02
F	0.19	-0.11	0.33	0.02	0.01	-0.05	0.00	0.00
GH	0.22	-0.35	0.84	-0.08	-0.04	-0.17	0.02	0.01
I	-0.16	-0.31	0.31	0.00	0.00	-0.15	0.00	0.00
JK	0.18	-0.11	0.24	0.09	0.04	-0.05	-0.02	-0.01
LQ	0.01	-1.03	1.31	0.27	0.13	-0.51	-0.11	-0.05
Total	-0.61	-3.70	4.92	-0.07	-0.04	-1.82	0.07	0.03

(in percentage of total employed in 2002 per year)

		VA Shares			Productivity			Employment shares		
		2002	2007	2012	2002	2007	2012	2002	2007	2012
LV	AB	0.08	0.07	0.06	7218	10360	14685	0.15	0.13	0.10
	CDE	0.27	0.27	0.26	19984	27378	36759	0.20	0.18	0.17
	F	0.06	0.07	0.07	14967	16447	18040	0.06	0.07	0.09
	GH	0.17	0.17	0.17	14122	16503	19138	0.18	0.20	0.21
	I	0.16	0.15	0.14	25651	36245	50071	0.09	0.08	0.07
	JK	0.11	0.12	0.13	29115	34485	39610	0.05	0.06	0.07
	LQ	0.15	0.16	0.17	7688	10512	13880	0.28	0.28	0.29

	Total change in employment	Productivity effect	Output effect	Structural effect	Structure output effect	Productivity output effect	Productivity structure effect	Mixed effect
AB	-64825	-88509	85621	-25082	-12339	-43537	12754	6274
CDE	-49183	-103749	111831	-7672	-3774	-51034	3501	1722
F	19389	-12104	34947	2023	995	-5954	-345	-170
GH	18142	-53382	100182	-2171	-1068	-26258	569	280
I	-33007	-49664	50091	-11777	-5793	-24430	5744	2825
JK	16750	-16314	30288	9853	4847	-8025	-2610	-1284
LQ	-17600	-142108	156680	45676	22469	-69902	-20378	-10025
Total	-110334	-465831	569641	10850	5337	-229140	-766	-377

	Total change in employment	Productivity effect	Output effect	Structural effect	Structure output effect	Productivity output effect	Productivity structure effect	Mixed effect
AB	-0.56	-0.76	0.74	-0.22	-0.11	-0.38	0.11	0.05
CDE	-0.42	-0.90	0.97	-0.07	-0.03	-0.44	0.03	0.01
F	0.17	-0.10	0.30	0.02	0.01	-0.05	0.00	0.00
GH	0.16	-0.46	0.87	-0.02	-0.01	-0.23	0.00	0.00
I	-0.29	-0.43	0.43	-0.10	-0.05	-0.21	0.05	0.02
JK	0.14	-0.14	0.26	0.09	0.04	-0.07	-0.02	-0.01
LQ	-0.15	-1.23	1.35	0.39	0.19	-0.60	-0.18	-0.09
Total	-0.95	-4.02	4.92	0.09	0.05	-1.98	-0.01	0.00

(in percentage of total employed in 2002 per year)

(Table A.5 contd.)

Table A.5 (continued)

		VA Shares			Productivity			Employment shares		
		2002	2007	2012	2002	2007	2012	2002	2007	2012
BG	AB	0.20	0.17	0.15	8513	12028	16809	0.26	0.22	0.18
	CDE	0.28	0.27	0.27	13053	18976	26812	0.24	0.22	0.20
	F	0.05	0.05	0.05	13537	14949	16474	0.04	0.05	0.06
	GH	0.12	0.13	0.13	8853	10816	13057	0.15	0.18	0.20
	I	0.13	0.12	0.12	19253	28487	40904	0.07	0.06	0.06
	JK	0.12	0.13	0.14	24141	29581	34935	0.06	0.07	0.08
	LQ	0.11	0.12	0.14	6691	9356	12587	0.18	0.20	0.22

	Total change in employment	Productivity effect	Output effect	Structural effect	Structure output effect	Productivity output effect	Productivity structure effect	Mixed effect
AB	-318223	-379599	378282	-172312	-84755	-186707	85047	41832
CDE	-209110	-363454	348359	-20981	-10320	-178766	10767	5296
F	37378	-21569	59515	8193	4030	-10609	-1461	-718
GH	39482	-147385	225129	33851	16650	-72492	-10900	-5361
I	-74671	-115061	106916	-14141	-6955	-56593	7485	3682
JK	31291	-51861	82556	25324	12456	-25508	-7825	-3849
LQ	6396	-251657	264260	148256	72922	-123778	-69443	-34157
Total	-487457	-1330587	1465016	8191	4029	-654454	13672	6725

	Total change in employment	Productivity effect	Output effect	Structural effect	Structure output effect	Productivity output effect	Productivity structure effect	Mixed effect
AB	-1.07	-1.27	1.27	-0.58	-0.28	-0.63	0.29	0.14
CDE	-0.70	-1.22	1.17	-0.07	-0.03	-0.60	0.04	0.02
F	0.13	-0.07	0.20	0.03	0.01	-0.04	0.00	0.00
GH	0.13	-0.49	0.76	0.11	0.06	-0.24	-0.04	-0.02
I	-0.25	-0.39	0.36	-0.05	-0.02	-0.19	0.03	0.01
JK	0.11	-0.17	0.28	0.09	0.04	-0.09	-0.03	-0.01
LQ	0.02	-0.84	0.89	0.50	0.24	-0.42	-0.23	-0.11
Total	-1.64	-4.47	4.92	0.03	0.01	-2.20	0.05	0.02

(in percentage of total employed in 2002 per year)

		VA Shares			Productivity			Employment shares		
		2002	2007	2012	2002	2007	2012	2002	2007	2012
RO	AB	0.08	0.07	0.06	7218	10360	14685	0.15	0.13	0.10
	CDE	0.27	0.27	0.26	19984	27378	36759	0.20	0.18	0.17
	F	0.06	0.07	0.07	14967	16447	18040	0.06	0.07	0.09
	GH	0.17	0.17	0.17	14122	16503	19138	0.18	0.20	0.21
	I	0.16	0.15	0.14	25651	36245	50071	0.09	0.08	0.07
	JK	0.11	0.12	0.13	29115	34485	39610	0.05	0.06	0.07
	LQ	0.15	0.16	0.17	7688	10512	13880	0.28	0.28	0.29

	Total change in employment	Productivity effect	Output effect	Structural effect	Structure output effect	Productivity output effect	Productivity structure effect	Mixed effect
AB	-1427220	-1737199	1653245	-678212	-333554	-854385	350495	172378
CDE	-620438	-1059700	1136443	-217929	-107180	-521179	99943	49153
F	139835	-60494	203022	21251	10451	-29752	-3114	-1532
GH	217379	-234215	477702	78684	38698	-115191	-18973	-9331
I	-110643	-236339	225105	23321	11470	-116236	-12042	-5922
JK	137389	-18706	103626	45364	22311	-9200	-4027	-1981
LQ	183404	-627973	742448	433601	213251	-308848	-180372	-88709
Total	-1480294	-3974624	4541592	-293920	-144554	-1954790	231909	114056

	Total change in employment	Productivity effect	Output effect	Structural effect	Structure output effect	Productivity output effect	Productivity structure effect	Mixed effect
AB	-1.55	-1.88	1.79	-0.73	-0.36	-0.93	0.38	0.19
CDE	-0.67	-1.15	1.23	-0.24	-0.12	-0.56	0.11	0.05
F	0.15	-0.07	0.22	0.02	0.01	-0.03	0.00	0.00
GH	0.24	-0.25	0.52	0.09	0.04	-0.12	-0.02	-0.01
I	-0.12	-0.26	0.24	0.03	0.01	-0.13	-0.01	-0.01
JK	0.15	-0.02	0.11	0.05	0.02	-0.01	0.00	0.00
LQ	0.20	-0.68	0.80	0.47	0.23	-0.33	-0.20	-0.10
Total	-1.60	-4.30	4.92	-0.32	-0.16	-2.12	0.25	0.12

(in percentage of total employed in 2002 per year)

Table A.6

Levels and changes of projections by occupations

		Levels			Absolute changes	
		2002	2007	2012	2002-2007	2007-2012
CZ	BCLS	385177	412485	442591	27308	30106
	BCHS	1646028	1543198	1489313	-102830	-53885
	WCLS	602539	657111	716864	54572	59752
	WCMS	404705	440628	484850	35923	44222
	WCHS	1722790	1812675	1929112	89885	116437
EE	BCLS	86586	81348	78362	-5238	-2986
	BCHS	176160	164606	158258	-11554	-6349
	WCLS	71124	75033	79768	3910	4735
	WCMS	26712	28921	32353	2209	3432
	WCHS	223066	223832	228971	766	5139
HU	BCLS	449791	456228	467829	6437	11601
	BCHS	1290786	1203262	1155426	-87524	-47836
	WCLS	539778	578368	622692	38589	44324
	WCMS	359149	383485	415840	24336	32356
	WCHS	1231096	1304592	1397909	73496	93317
LT	BCLS	357415	306032	269660	-51383	-36373
	BCHS	377371	351692	337451	-25679	-14241
	WCLS	167713	174476	182954	6763	8478
	WCMS	56391	63927	72733	7536	8805
	WCHS	447268	448722	457890	1454	9167
LV	BCLS	203260	177230	158731	-26031	-18498
	BCHS	245486	220689	205790	-24797	-14900
	WCLS	128915	129136	131304	222	2168
	WCMS	46525	50914	55982	4389	5068
	WCHS	353884	339046	333013	-14838	-6032
PL	BCLS	3516227	3022306	2679088	-493921	-343218
	BCHS	3437427	3274914	3202546	-162513	-72368
	WCLS	1570805	1682075	1816052	111270	133977
	WCMS	1100967	1182808	1280984	81841	98176
	WCHS	4153573	4328725	4564675	175152	235950
SI	BCLS	121502	116490	114613	-5012	-1876
	BCHS	268163	254479	248282	-13684	-6198
	WCLS	110850	122554	135720	11704	13166
	WCMS	96108	102592	111204	6484	8611
	WCHS	306412	326318	351961	19906	25643
SK	BCLS	225393	233134	243209	7741	10076
	BCHS	745818	688506	656025	-57312	-32481
	WCLS	293639	315115	339396	21477	24281
	WCMS	138021	154544	174613	16523	20069
	WCHS	724330	755864	800568	31534	44704
BG	BCLS	813344	664767	558226	-148577	-106541
	BCHS	802614	680467	602548	-122147	-77919
	WCLS	340915	336908	339861	-4007	2953
	WCMS	183223	185200	190851	1977	5651
	WCHS	838557	810075	799620	-28482	-10455
RO	BCLS	3727746	2934653	2374650	-793093	-560003
	BCHS	2610566	2274410	2056208	-336156	-218202
	WCLS	730986	801870	875319	70884	73449
	WCMS	370357	407388	451017	37031	43629
	WCHS	1794646	1887076	1996872	92430	109796

Table A.7

Levels and changes by educational levels

		GDP growth rate: 4 % p.a.					GDP growth rate: 5 % p.a.				
		Levels			Absolute changes		Levels			Absolute changes	
		2002	2007	2012	2002-2007	2007-2012	2002	2007	2012	2002-2007	2007-2012
CZ	LE	359783	355887	358953	-3896	3066	359783	376310	401274	16528	24963
	ME	3788410	3851426	3988447	63016	137021	3788410	4050771	4413220	262361	362449
	HE	631567	677754	735067	46187	57313	631567	708407	802455	76840	94048
	Total	4779760	4885067	5082467	105306	197400	4779760	5135488	5616949	355728	481461
EE	LE	42785	41211	40703	-1574	-507	42785	43078	44495	293	1417
	ME	248087	242105	242230	-5981	124	248087	254916	268610	6829	13694
	HE	136303	136642	139931	339	3290	136303	143458	154193	7156	10735
	Total	427174	419957	422864	-7216	2907	427174	441452	467298	14279	25846
HU	LE	645708	632728	632689	-12981	-38	645708	664222	697728	18514	33506
	ME	2547604	2576423	2657914	28819	81491	2547604	2707135	2935923	159531	228788
	HE	677328	716783	769094	39455	52311	677328	755906	853053	78578	97147
	Total	3870640	3925933	4059697	55293	133764	3870640	4127262	4486704	256622	359442
LT	LE	165636	146877	134092	-18759	-12785	165636	153811	147179	-11825	-6632
	ME	973651	926064	904636	-47587	-21428	973651	973514	1000368	-136	26853
	HE	396799	396232	404049	-566	7816	396799	417110	446901	20311	29792
	Total	1536086	1469174	1442777	-66912	-26397	1536086	1544435	1594449	8349	50013
LV	LE	165528	146501	133737	-19027	-12764	165528	153488	146878	-12041	-6609
	ME	738002	693473	670103	-44529	-23371	738002	729702	742052	-8300	12350
	HE	254521	245864	243878	-8657	-1986	254521	258240	268894	3719	10654
	Total	1158051	1085839	1047717	-72213	-38122	1158051	1141429	1157824	-16622	16395
PL	LE	1858252	1646915	1505279	-211337	-141636	1858252	1728450	1659579	-129802	-68870
	ME	9734933	9561342	9621066	-173591	59724	9734933	10100034	10600036	365101	500002
	HE	2185861	2282570	2417000	96709	134430	2185861	2400442	2667690	214581	267248
	Total	13779046	13490827	13543345	-288219	52518	13779046	14228926	14927305	449880	698379
SI	LE	148697	140479	136035	-8218	-4444	148697	148452	152126	-245	3674
	ME	512921	527607	553468	14686	25861	512921	554895	612286	41974	57391
	HE	130882	141499	154615	10617	13116	130882	147682	168412	16801	20729
	Total	792500	809585	844118	17086	34533	792500	851029	932824	58529	81795
SK	LE	121516	118926	118621	-2590	-305	121516	125916	132753	4400	6837
	ME	1725982	1730181	1772708	4199	42527	1725982	1818736	1959739	92754	141004
	HE	279742	298054	322482	18312	24428	279742	312640	354194	32898	41554
	Total	2127240	2147161	2213811	19921	66650	2127240	2257292	2446686	130051	189394
BG	LE	758593	630383	541185	-128210	-89198	758593	662997	598935	-95595	-64062
	ME	1557575	1407010	1315343	-150565	-91667	1557575	1479353	1455769	-78222	-23584
	HE	662395	640024	634578	-22371	-5446	662395	672255	698310	9861	26055
	Total	2978562	2677416	2491106	-301146	-186311	2978562	2814606	2753014	-163956	-61592
RO	LE	2856549	2279409	1874090	-577140	-405319	2856549	2392905	2066189	-463644	-326716
	ME	5388507	5004316	4805175	-384191	-199141	5388507	5249803	5292815	-138704	43012
	HE	989244	1021608	1074742	32364	53134	989244	1088516	1210564	99271	122048
	Total	9234300	8305333	7754007	-928967	-551326	9234300	8731224	8569568	-503076	-161656

Table A.8

Potential mismatches in demand and supply by education

		Supply			Demand			Employment Rate		
		2002	**2007**	**2012**	**2002**	**2007**	**2012**	**2002**	**2007**	**2012**
CZ	**LE**	1347	1195	1012	350	366	390	26.0	30.6	38.6
	ME	5093	5175	5078	3721	3979	4335	73.1	76.9	85.4
	HE	701	763	805	605	679	769	86.3	88.9	95.5
	Total	7141	7134	6895	4676	5024	5495	*65.5*	*70.4*	*79.7*
EE	**LE**	196	165	137	52	53	54	26.6	31.9	39.8
	ME	496	491	504	334	343	362	67.4	69.9	71.7
	HE	220	218	232	177	186	200	80.1	85.3	86.0
	Total	913	874	873	563	582	616	*61.7*	*66.6*	*70.5*
HU	**LE**	2211	1885	1675	633	651	684	28.6	34.6	40.8
	ME	3828	3983	3975	2551	2711	2940	66.6	68.1	74.0
	HE	810	852	873	663	740	835	81.8	86.8	95.6
	Total	6850	6720	6523	3847	4102	4459	*56.2*	*61.0*	*68.4*
LT	**LE**	553	495	445	145	134	129	26.2	27.1	28.9
	ME	1316	1310	1258	895	895	920	68.0	68.3	73.1
	HE	432	455	495	356	374	400	82.3	82.1	80.9
	Total	2301	2260	2198	1395	1403	1448	*60.6*	*62.1*	*65.9*
LV	**LE**	411	362	310	133	123	118	32.4	34.0	38.0
	ME	920	913	875	619	612	623	67.3	67.1	71.1
	HE	259	266	281	209	212	221	80.7	79.9	78.6
	Total	1590	1541	1466	961	947	961	*60.5*	*61.5*	*65.5*
PL	**LE**	6733	5870	5100	1684	1567	1504	25.0	26.7	29.5
	ME	16793	16413	17109	9701	10064	10563	57.8	61.3	61.7
	HE	2579	2848	3091	2124	2332	2592	82.4	81.9	83.9
	Total	26105	25131	25299	13509	13950	14634	*51.7*	*55.5*	*57.8*
SI	**LE**	375	326	281	157	157	161	41.8	48.1	57.2
	ME	837	846	836	581	629	694	69.5	74.3	83.0
	HE	163	185	202	141	159	181	86.4	86.1	89.8
	Total	1375	1357	1319	879	944	1035	*63.9*	*69.6*	*78.5*
SK	**LE**	779	670	562	121	125	132	15.5	18.7	23.5
	ME	2628	2770	2829	1710	1801	1941	65.0	65.0	68.6
	HE	321	356	386	275	308	349	85.8	86.5	90.3
	Total	3729	3796	3778	2106	2235	2422	*56.5*	*58.9*	*64.1*
BG	**LE**	1811	1583	1372	498	435	393	27.5	27.5	28.7
	ME	2647	2708	2659	1550	1472	1449	58.5	54.4	54.5
	HE	941	994	1015	712	723	751	75.7	72.7	74.0
	Total	5400	5285	5046	2760	2608	2551	*51.1*	*49.4*	*50.6*
RO	**LE**	5334	4673	4133	2338	1959	1691	43.8	41.9	40.9
	ME	8746	9267	9541	5623	5478	5523	64.3	59.1	57.9
	HE	1236	1378	1463	1014	1115	1240	82.0	81.0	84.8
		15315	15317	15137	8974	8486	8328	*58.6*	*55.4*	*55.0*

Note: Assumed GDP growth: 5%.

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