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Labour mobility within the EU in the context of enlargement and the functioning of the transitional arrangements

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Deliverable 4

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The macroeconomic consequences of labour mobility

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Abstract

This deliverable examines the impact of the EU Eastern enlargement on wages, unemployment and other macroeconomic variables. For this purpose we employ two general equilibrium models which both analyse the economic consequences of labour mobility in the context of the EU Eastern enlargement in a setting of imperfect labour markets. The first model is based on a nested production function, which enables us to examine the migration effects for the different cells of the labour market. The second model is based on a CGE-framework, which allows us to consider the links between labour migration, trade and international capital mobility. Moreover, it enables us to examine the sectoral implications of labour mobility in detail. Both models assume that capital stocks adjust to labour supply shocks at least in the long-run.

We analyse the impact of Eastern enlargement during the years from 2004 to 2007 and compare it to the situation where no enlargement took place. We find remarkably similar results in both simulation models. The EU Eastern enlargement has only a moderate impact on labour markets. Especially in the long-run, labour mobility is neutral for wages in both the sending and the receiving countries and has only a negligible impact on the unemployment rate. Nevertheless our simulations suggest that increased labour mobility yields an aggregate gain in terms of GDP in the enlarged EU.

Furthermore we examine the potential effects of introducing free movement in the enlarged EU. Based on our projections we contrast a prolongation of the migration restrictions until the end of the transitional periods with a scenario where we allow for free movement already at the beginning of 2009. Although the impact on the entire EU is rather small, single receiving countries are affected differently. This is because introducing free movement also changes the regional distribution of migration flows.

The views and opinions expressed in this publication are those of the authors and do not necessarily represent those of the European Commission.

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1 Introduction

This deliverable examines the impact of labour mobility on wages, (un-)employment, GDP and other macroeconomic variables in the context of the EU Eastern enlargement. Our analysis addresses both the destination and the sending country perspective. We distinguish two main labour supply shocks here: the migration from the NMS-8 and from the NMS-2 into the EU-15. The first group covers the eight Central and Eastern European countries[1] which joined the EU in May 2004; the second group Bulgaria and Romania which joined the EU in January 2007. The candidate countries, which may accede during the next decade, are not considered at this stage of the study, since Eastern enlargement has only modestly affected migration from there, if at all.

The study is based on two macroeconomic models which address different aspects of the macroeconomic implications of migration. The first model employs a general equilibrium framework for analysing the effects of migration in a setting with imperfect labour markets. The model uses a nested production function which groups the labour force by education, work experience, and national origin. This enables us to examine the wage and employment effects of migration for the different segments of the labour market. This model can be applied for both the analysis of the short-run and the long-run effects of labour mobility.

The second model analyses the labour market effects of labour mobility also on basis of a model with imperfect labour markets. In contrast to the first model, the impact of migration on different industries is modelled within a computable general equilibrium (CGE) framework. This enables us to assess not only the sectoral impact of migration, but also the links between labour mobility and international trade and capital mobility. In this second model we focus on the analysis of the UK, Germany, Poland, Hungary, Slovenia, and Slovakia. The rather broad range of countries allows us, however, to capture the different ways by which the sending and receiving countries in the enlarged EU are affected by labour mobility.

The analysis of the impact of immigration on the destination and sending countries in the enlarged EU is carried out here for both models in two steps. In the first step, we analyse the impact of the actual migration movements which took place under the current institutional and legal conditions during the years from 2004 to 2007 and contrast this with a counterfactual scenario of no EU enlargement. In the second step, based on our projections, we contrast a prolongation of the migration restrictions until the end of the transitional periods with a scenario where we allow for free movement already at the beginning of 2008. The purpose of these scenarios is to grasp the main changes in immigration policies which have been carried out in the context of the EU Eastern enlargement.

[1] Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovak Republic, and Slovenia.

The remainder of this deliverable is organised as follows. First, we review the relevant literature. Second, we discuss the theoretical considerations which form the basis of the later analysis. Third, we describe the immigration scenarios employed in the simulations. Fourth, we present the first simulation model, the estimates of the relevant parameters and the simulation results. Fifth, we describe the CGE model which analyses the links between migration, sectoral change, international trade and international capital movements and present the simulation results based on this model. The final section draws conclusion on the macroeconomic and structural effects of migration in the context of the EU's Eastern enlargement.

2 A review of the literature

The impact of migration on wages and employment in the context of the EU's Eastern enlargement has been addressed meanwhile by numerous studies. We can distinguish three strands in the literature: The first strand of literature is based on econometric estimates using the regional variance of the migration share for the identification of the wage and employment effects of immigration. The second approach uses the variance of the migration share across the education and experience cells of the labour market at the national level for identification. Finally, the third approach uses CGE or other macroeconomic models for the simulation of the labour market effects.

The spatial correlation approach has been widely applied in the US and European literature during the 1990s for an evaluation of the labour market effects of immigration. Both the wage and employment effects of migration are small and seem to cluster about zero (see Borjas, 2003; Friedberg and Hunt, 1995, for a discussion). Recent meta-analyses of this literature indicate that an increase in the labour force by 1 per cent reduces native wages by less than 0.1 per cent and increases the unemployment risk of natives by less than 0.1 percentage point (DeLonghi et al., 2005; 2006). A recent study for the UK based on this approach finds that immigration from the NMS has a small positive impact on wages and a small negative impact on unemployment of natives (Lemos and Portes, 2008), supporting earlier findings by Dustmann et al. (2005) for the UK. Both effects are, however, insignificant.

The spatial correlation approach may yield spurious results if migrants are not randomly distributed across locations. Large parts of this literature therefore rely either on natural experiments or use instrumental variable or difference-in-difference estimators in addressing this endogeneity problem (see e.g. Dustmann and Glitz, 2005, for a discussion). It remains nevertheless controversial whether the wage and employment effects of immigration can be properly identified by the spatial correlation approach. Another part of the empirical literature therefore uses the variance of migrants across education and experience cells in the labour market at the national level for identification. In his seminal study, Borjas (2003) finds for the US that a 1 per cent increase of the labour force through immigration reduces native wages substantially by about 0.3 to 0.4 per cent. Similar results are obtained by Aydemir and Borjas (2006). In contrast, Ottaviano and Peri (2006) reconcile the findings of the spatial correlation studies. They estimate that the impact of immigration on native wages is almost neutral, while foreign workers tend to lose substantially. Similar results have been obtained

recently for the UK by Manacorda et al. (2006) and for Germany by Brücker and Jahn (2008), D'Amuri et al. (2008), and Felbermayr et al. (2008). All these studies find that an increase of the foreign labour force by 1 per cent reduces native wages by less than 0.1 per cent and increases native unemployment risks by less than 0.1 percentage points.

The third strand of the literature addresses the macroeconomic impact of migration on basis of general equilibrium models. This type of macroeconomic modelling is very flexible and provides a comprehensive framework which facilitates the analysis of the interaction between trade, migration and capital movements and their subsequent labour market impacts. A number of these studies have addressed the labour market effects of immigration in the context of the Eastern enlargement. The main focus of this literature is on the changing skill composition of the labour force through immigration. Assuming that the low-skilled and high-skilled labour force in Austria would increase by 10.5 and 2.1 per cent, respectively, Keuschnigg and Kohler (1999) estimate a 5 per cent decrease in wages for low-skilled workers. Heijdra et al. (2002) estimate the effect of migration from the NMS to Germany. They assume that migration from Eastern European countries to Germany would rise from 550,000 in 2008 to 2.5 million in 2030, with 35 per cent of the migrant population entering the labour market. 40 per cent of the migrants are assumed to be skilled and 60 per cent unskilled. As a result, less skilled workers suffer from reduced wages and higher unemployment, while skilled labour benefits from migration through higher wages and lower unemployment. Brücker and Kohlhaas (2004) find that, depending on the assumptions on the qualifications of the migrant population, wages can decline by 0.5–0.6 per cent for an immigration rate of 1 per cent of the labour force, while the unemployment rate increases by 0.02–0.1 percentage points. In another study, Brücker (2007) demonstrates that if 4 per cent of the population from the NMS migrate into the EU-15, the main winners of migration are the migrants themselves, while blue-collar workers are negatively affected through higher unemployment in the destination countries.

Altogether, this literature finds wage and employment effects of immigration which are somewhat larger than those found by the econometric literature. However, the still relatively modest negative effects of immigration on wages and unemployment of particularly low-skilled workers are outweighed by positive and strong effects resulting from the integration of the NMS into the goods markets of the EU (e.g. Brown et al., 1995; Baldwin et al., 1997). Consequently, most models predict that Eastern enlargement results in lower aggregate unemployment and higher wages in both the EU-15 and the NMS.

Not surprisingly, all CGE models predict that enlargement increases the GDP in the receiving countries and the total EU. In earlier studies, this effect was predicted to vary between 0.1 per cent and 0.5 per cent in the EU-15, and between 5 per cent and 18 per cent in the NMS. More recent studies, which take into account trade creation between the old and new member countries, estimate slightly larger effects on GDP of the EU-15. Boeri and Brücker (2005) estimate a 0.5 per cent gain in the income per capita if 3 per cent of the population from the NMS migrate into the EU-15. However, these aggregate and per capita income gains may be reduced if rigidities in the labour market exist. Finally, analysing possible diversion effects due to transitional periods, Baas and Brücker

(2008) conclude that the closure of labour markets in Germany has reduced the GDP effect, while the opening-up of the UK has resulted in a higher GDP.

Most studies addressing the macroeconomic effects of migration in the context of the EU Eastern enlargement employ a CGE framework. A notable exception is the recent study by Barrett et al. (2007). This study uses a large new Keynesian macroeconometric model to describe the absorption of a labour supply shock triggered by the EU Eastern enlargement. In contrast to the general equilibrium framework, these types of macroeconomic models are less rigorously founded on theoretical models but cover a huge variety of economic relations. Interestingly enough, the differences between the Barrett et al. (2007) study and the results reported from the CGE literature are quite small.[2]

3 Theoretical considerations

From a global perspective, international migration increases the productive use of human resources and hence, global output. Many simulation models suggest that the gains from opening labour markets to international migration can easily dwarf potential gains from a further liberalization of international goods and capital markets (Hamilton and Whalley, 1984). This has been also demonstrated for labour migration within the European continent (Boeri and Brücker, 2005).

But international migration does not only create winners. The standard textbook model of migration predicts that international labour mobility generates aggregate gains for natives in the receiving countries, while natives left behind in the sending countries tend to lose (e.g. Wong, 1995, Ch. 14). Moreover, production factors in receiving countries which are net complements to migrant labour tend to win, while those which are net substitutes tend to lose. More specifically, labour is expected to lose at the destination. The converse applies to the sending countries.

One key assumption of the textbook model of migration is that labour markets clear. Relaxing this assumption yields different results (Boeri and Brücker, 2005; Levine, 1999). In case of rigid labour markets and unemployment, migrants can replace native workers in recipient countries. Hence, unemployment can increase, which may furthermore trigger higher welfare expenditures for both natives and migrants. As a consequence, natives in the receiving countries may lose, while those in the sending countries may gain. Considering labour market rigidities is particularly relevant in the context of this study, since many EU countries still suffer from high and persisting unemployment rates. The concern that migration from the new member states may increase unemployment is therefore one of the main arguments for the application of transitional arrangements for the free movement of workers. Indeed we find in our simulations rising unemployment and shrinking wages in the short-run, which are caused by wage rigidities.

[2] Barell et al. (2007) find that immigration of 1 per cent of the population leads to a 1.1 per cent increase in GDP while Baas and Brücker (2008) report a 1 per cent increase in GDP.

However, labour migration may have very different effects in the different cells of the labour market. It may create additional labour demand for certain types of labour and may reduce it for others. Depending on the wage flexibility in the different segments of the labour markets, it may therefore either increase or reduce aggregate unemployment. Moreover, depending on the elasticities of substitution between native and foreign labour, labour immigration may increase wages and employment opportunities of natives in the host countries, even if aggregate wages decline and the aggregate unemployment is increasing (see e.g. Ottaviano and Peri, 2006, for US evidence).

An important issue for an assessment of the migration impacts is the adjustment of other markets in the economy. The standard migration model is based on the assumption that capital stocks are fixed, which is hardly realistic if we consider that investors exploit profit opportunities. Indeed, it is one of the few empirically supported facts in economics that the capital-output ratio and, hence, the productivity adjusted capital intensity of production remains constant over time (Kaldor, 1961). This implies that capital stocks adjust in one way or another to labour supply shocks, which in turn implies that the aggregate impact of migration on wages is mitigated when capital adjusts in the long-run. We thus consider the adjustment of capital stocks here and examine empirically whether and to what extent capital stocks adjust even in the short-run.

International links via goods and capital markets can further reduce the impact of labour mobility on wages and unemployment in the receiving and sending countries. The standard models of trade theory suggest that the impact of labour mobility on factor prices and employment opportunities is mitigated if migration, trade and capital movements are substitutes (see Venables, 1999, for a discussion). Under the extreme assumption that international demand on the goods markets is perfectly elastic, international migration has no impact on wages and employment opportunities. Although this is empirically not very likely, trade and capital movements may contribute to reduce the migration impacts.

Against this background the two types of models employed here may deliver slightly different results: The first model analyses the domestic adjustment of economies mainly via the labour market. It considers the elasticities of substitution and complementarities in the different cells of the labour market in detail. Adjustments in other markets are only considered as long as they affect the capital-output ratio. Considering the capital-output ratio enables us, however, to capture the adjustment of capital stocks via domestic or international investment, which may be the most important channel of adjustment. The second type of model goes beyond this in considering the adjustment of the sectoral structure of the economy via international trade and shifts in the structure of demand and production. We therefore expect that the short-term migration impact on both the receiving and the sending countries will be smaller in the second type of model.

4 Migration scenarios

The analysis of the impact of migration on the destination and sending countries in the enlarged EU follows two questions. (i) What is the impact of Eastern enlargement during the years from 2004 to 2007 compared to a scenario where no enlargement took place?

(ii) What are the potential implications if free movement is introduced in the entire EU at the beginning of 2008 compared to a scenario where the present immigration restrictions under the transitional arrangements for the free movement of worker continue? The purpose of these scenarios is to grasp the main changes in immigration policies which have been carried out in the context of the EU Eastern enlargement.

4.1.1 Transitional arrangements vs. no EU Eastern enlargement

First we analyse the impact of the migration which took place since EU enlargement from 2004 to 2007. As has been outlined in Deliverable 2, the EU Eastern enlargement involved a distinct increase in migration from the NMS-8 and a diversion of migration flows away from Austria and Germany towards Ireland and the UK. In our counterfactual scenario we assume that the pre-enlargement conditions for migration between the NMS on the one hand and the EU-15 on the other hand prevail. This scenario does not assume that no labour mobility takes place, but that both the overall scale and the regional distribution of immigration flows stay at their pre-enlargement levels. We thus base the immigration from 2004 to 2007 on an extrapolation of the average immigration during the 1999-2003 period in this counterfactual scenario. This scenario is contrasted by the EU Eastern enlargement scenario. In the EU Eastern enlargement scenario we have calculated the actual increase in the migration stocks between 2004 and 2007.[3] The difference between these two scenarios is treated here as the "EU enlargement effect", i.e. the migration effect which has been caused by the EU's Eastern enlargement. Table 1 displays the scenarios for the EU-15 and the individual receiving countries from the NMS-8.[4] The foreign population from the NMS-8 in the EU-15 has increased from 874,000 in 2003 to 1.9 million persons in 2007 or by one million persons. According to our counterfactual scenario, the increase would have been a mere 199,000 persons without enlargement, yielding a migration effect of 837,000 persons which can be attributed to the EU's Eastern enlargement.

[3] We have, in case of missing information in some countries, estimated the 2007 figures, which yield slightly higher results than the actual figures presented in Deliverable 2.

[4] Note that due to missing information Portugal is excluded throughout the simulations.

Table 1: Migration stock for the NMS-8, 2003-2007 scenario

	Foreign residents from NMS-8 in persons				Foreign residents from NMS-8 in per cent of population			
	Benchmark	Counterfactual scenario	Enlargement scenario	Enlargement effect	Benchmark	Counterfactual scenario	Enlargement scenario	Enlargement effect
	2003	2007	2007		2003	2007	2007	
AT	60255	64596	89940	25344	0.75	0.81	1.12	0.32
BE	16151	23242	42918	19676	0.16	0.22	0.41	0.19
DE	427958	492123	554372	62249	0.52	0.60	0.68	0.08
DK	9807	11220	22146	10926	0.18	0.21	0.41	0.20
ES	46710	82863	131118	48255	0.11	0.20	0.31	0.12
FI	15825	19154	23957	4803	0.30	0.37	0.46	0.09
FR	33858	29690	36971	7281	0.06	0.05	0.06	0.01
GR	16413	21582	20257	-1325	0.16	0.20	0.19	-0.01
IE	34246	60657	178504	117847	0.86	1.52	4.47	2.95
IT	54665	74909	117042	42133	0.10	0.13	0.20	0.07
LU	1574	2568	5101	2533	0.36	0.58	1.15	0.57
NL	13048	16861	36317	19456	0.08	0.11	0.23	0.12
SE	21147	19301	42312	23011	0.24	0.22	0.47	0.26
UK	122465	154198	609415	455217	0.21	0.27	1.05	0.78
CZ	71019	95954	104442	8488	0.70	0.94	1.03	0.08
EE	26070	33922	36735	2813	1.93	2.51	2.72	0.21
HU	87680	88285	132582	44297	0.88	0.88	1.33	0.44
LT	53557	88922	128361	39439	1.55	2.58	3.73	1.14
LV	23863	32559	42547	9987	1.02	1.40	1.83	0.43
PL	532942	632111	1297647	665536	1.42	1.68	3.45	1.77
SI	35051	40958	35848	-5110	1.76	2.05	1.80	-0.26
SK	43938	60252	132207	71955	0.82	1.12	2.45	1.34
EU-15[1)]	**874122**	**1072964**	**1910370**	**837406**	**0.24**	**0.29**	**0.52**	**0.23**
NMS-8	**874122**	**1072964**	**1910370**	**837406**	**1.21**	**1.48**	**2.64**	**1.16**

1) Without Portugal.
Notes: The stock of foreign residents in 2003 is used as a benchmark. The counterfactual scenario assumes that immigration flows continue at their pre-enlargement levels, while the enlargment scenario refers to the actual figures observed in 2007. Therefore the difference of the enlargement- and the counterfactual scenario is treated as the "enlargement effect".

Sources: Own calculations and estimates based on the figures from national population statistics and the European LFS.

Immigration from Bulgaria and Romania has already accelerated before enlargement as a consequence of the immigration policies in Spain and Italy. The foreign population from Bulgaria and Romania in the EU-15 has grown between the end of 2003 and 2007 from 694,000 to 1.9 million persons or by 1.2 million persons (see Table 2). We can not attribute this increase to the EU's Eastern enlargement since the NMS-2 joined the EU-15 at January 1st, 2007. Therefore, we use a zero immigration scenario as a counterfactual to the actual increase from the population from Bulgaria and Romania in our later analysis. This measures, however, the impact of relaxed immigration conditions in the EU-15 for these two countries and not the EU Eastern enlargement effect.

Table 2: Migration stock for the NMS-2, 2003-2007 scenario

	Foreign residents from NMS-2 in persons			Foreign residents from NMS-2 in per cent of population		
	Benchmark	Enlargement scenario	Difference	Benchmark	Enlargement scenario	Difference
	2003	2007	2003-2007	2003	2007	2003-2007
AT	26802	36792	9990	0.34	0.46	0.12
BE	6831	23810	16979	0.07	0.23	0.16
DE	107850	131402	23552	0.13	0.16	0.03
DK	1834	3316	1482	0.03	0.06	0.03
ES	277814	828772	550958	0.67	1.98	1.32
FI	887	1388	501	0.02	0.03	0.01
FR	8840	43652	34812	0.02	0.07	0.06
GR	30583	52567	21984	0.29	0.50	0.21
IE	17526	24496	6970	0.44	0.61	0.17
IT	189279	658755	469476	0.33	1.15	0.82
LU	498	1085	587	0.11	0.25	0.13
NL	4413	11272	6859	0.03	0.07	0.04
SE	3148	6280	3132	0.04	0.07	0.03
UK	17979	40023	22044	0.03	0.07	0.04
BG	159243	310335	151092	2.04	3.97	1.93
RO	535041	1553276	1018234	2.47	7.16	4.70
EU-15[1)]	**694284**	**1863610**	**1169326**	**0.19**	**0.51**	**0.32**
NMS-2	**694284**	**1863610**	**1169326**	**2.35**	**6.32**	**3.96**

1) Without Portugal.
Notes: The stock of foreign residents in 2003 is used as a benchmark. The enlargment scenario refers to the actual figures observed in 2007. The simulation is based on the net migration flows observed for the period 2003 to 2007.

Sources: Own calculations and estimates based on the figures from national population statistics and the European LFS.

The immigration influx varies widely across the EU-15 countries. The net inflow of residents from the NMS-8 which has been caused by EU enlargement amounts to 3 per cent of the population in Ireland, 0.8 per cent in the UK and 0.6 per cent in Luxembourg compared to 0.2 per cent at the EU-15 level according to our scenario. The net inflow of residents from the NMS-2 in the 2004-2007 period amounts to 1.3 per cent of the population in Spain, 0.8 per cent of the population in Italy and 0.2 per cent of the population in Greece, compared to 0.3 per cent at the EU-15 level.

Among the NMS-8, an outflow of about 1.8 per cent of the population in Poland has been caused by the EU Eastern enlargement according to our scenarios during the 2004 to 2007 period, compared to 1.2 per cent for all NMS-8 countries. During the same period of time, the net outflow amounted 4.7 per cent of the population in Romania and 1.9 per cent of the population in Bulgaria.

4.1.2 Free movement vs. prolongation of transitional arrangements

In the next step we analyse the potential impact of removing the remaining immigration restrictions which are in place under the transitional arrangements. In case of the NMS-8, the remaining EU-15 countries which have still immigration restrictions in place have to decide whether to maintain these restrictions or to introduce the free movement in 2009. Particularly relevant is this decision in case of Austria and Germany, since these two countries are still important destinations for migrants from the NMS. In case of Bulgaria and Romania, most EU member states have to decide whether to prolong the immigration restrictions which are still in place vis-à-vis the NMS-2 in the second phase of the transitional arrangements beginning with January 1st, 2009.

For the assessment of the macroeconomic effects of transitional periods we employ two policy scenarios. Both policy scenarios rely on the migration forecasts carried out in Deliverable 11. The status quo scenario is based on the assumption that the migration restrictions which are applied at present will be maintained until the end of the transitional period. Germany and Austria thus employ the same set of immigration restrictions for workers from the NMS-8 until the end of the transitional periods, while the UK, Ireland, and Sweden continue to grant workers from the NMS-8 free access to their labour markets. Analogously, the EU member states maintain their immigration restrictions which are currently in place vis-à-vis Bulgaria and Romania. Consequently, we assume that the overall scale of immigration from the NMS-8 and the NMS-2 follows the status quo scenario outlined in Deliverable 11, and that the regional distribution of the inflows of migrants across the EU-15 destination countries remains constant during this period. The free movement scenario is again based on the projections carried out in Deliverable 11. Note that the free movement scenario relies on the assumption that the elasticity of migration with respect to the income difference and labour market variables is similar in the NMS compared to other sending countries in the EU-15. Nevertheless, the free movement scenario expects that immigration from the NMS-8 and the NMS-2 will further accelerate if the free movement is introduced compared to its level under the transitional arrangement. The difference between the free movement scenario and the status quo scenario illustrates the migration effect caused by the introduction of free movement in 2009.

Introducing the free movement will affect not only the overall scale of migration in the enlarged EU, but also the regional distribution of migrants across destination countries. Due to missing historical evidence, we can hardly forecast the future distribution of migrants from the NMS across the EU-15. Therefore, we have to base our free movement scenario an assumptions here. We assume that the regional migration pattern before 2004 reflect the free choice of migrants such that future migration under the free movement will display a similar regional pattern. As a consequence some countries (e.g. Germany and Austria) receive more migrants while others (e.g. UK and Ireland) attract less. This counterfactual policy scenario is of course based on the heroic assumption of constant behaviour of migrants and ignores that network effects etc. established since 2004 will certainly affect future migration flows. The reversion in the geographical structure of migration flows to the pre-enlargement structure can thus be considered as the most extreme assumption. The actual regional migration pattern is likely to be

between the present regional distribution and the regional distribution of migration flows before EU enlargement.

Table 3 displays the scenarios for the EU-15 and the individual NMS-8 countries between the end of 2007 and 2011. As briefly mentioned above, the introduction of free movement increases the overall stock of migrants by 86,000 persons. The diversion of migration flows is illustrated by the increase of 0.3 and 0.2 per cent of population in Austria and Germany and the decrease by 0.9 and 0.2 per cent of population in Ireland and the UK.

Table 3: Migration stock forecasts for the NMS-8 (2007-2011)

	Foreign residents from NMS-8 in persons				Foreign residents from NMS-8 in per cent of population			
	Benchmark	Status Quo scenario	Free movement scenario	Free movement effect	Benchmark	Status Quo scenario	Free movement scenario	Free movement effect
	2007	2011	2011		2007	2011	2011	
AT	83978	106452	127768	21316	1.03	1.30	1.56	0.26
BE	42918	65669	64071	-1598	0.40	0.62	0.60	-0.02
DE	554372	661819	847899	186080	0.68	0.81	1.04	0.23
DK	22146	32634	33198	564	0.41	0.60	0.61	0.01
ES	100832	151287	150856	-431	0.23	0.34	0.34	0.00
FI	23957	30869	36395	5526	0.45	0.59	0.69	0.10
FR	36971	39617	57038	17421	0.06	0.07	0.09	0.03
GR	20257	23525	31055	7530	0.19	0.22	0.29	0.07
IE	178504	301117	263438	-37680	4.10	6.91	6.04	-0.86
IT	107251	151947	161436	9489	0.18	0.26	0.27	0.02
LU	5101	8099	7583	-516	1.10	1.74	1.63	-0.11
NL	36317	56095	54160	-1935	0.22	0.35	0.33	-0.01
SE	42312	60301	63650	3348	0.46	0.66	0.70	0.04
UK	609415	1023305	899896	-123410	1.02	1.71	1.50	-0.21
CZ	102198	146687	177213	30526	0.99	1.42	1.72	0.30
EE	36444	46480	50816	4336	2.72	3.48	3.80	0.32
HU	128345	185227	218068	32841	1.30	1.87	2.20	0.33
LT	124885	182420	186470	4049	3.69	5.39	5.51	0.12
LV	41996	72768	75726	2957	1.84	3.19	3.32	0.13
PL	1270620	1835359	1840739	5380	3.41	4.92	4.94	0.01
SI	35701	26389	37326	10936	1.77	1.31	1.85	0.54
SK	124142	217405	212084	-5321	2.30	4.03	3.93	-0.10
EU-15[1)]	**1864331**	**2712735**	**2798441**	**85705**	**0.50**	**0.72**	**0.75**	**0.02**
NMS-8	**1864331**	**2712735**	**2798441**	**85705**	**2.59**	**3.77**	**3.89**	**0.12**

1) Without Portugal.
Notes: The stock of foreign residents in 2007 is used as a benchmark. The status quo scenario refers to migration projections assuming that the transitional arrangements are prolonged, while the free movement scenario refers to projections which assume that free movement is introduced in the entire EU. Therefore the difference of the status quo and the free movement scenario is treated as the "free movement effect".

Sources: Own calculations and estimates.

With regard to Bulgaria and Romania, the introduction of free movement increases the stock of migrants in the EU-15 by 104,000 persons between the end of 2007 and 2014 (compare Table 4).

Table 4: Migration stock forecasts for the NMS-2 (2007-2014)

	Foreign residents from NMS-2 in persons				Foreign residents from NMS-2 in per cent of population			
	Benchmark	Status Quo scenario	Free movement scenario	Free movement effect	Benchmark	Status Quo scenario	Free movement scenario	Free movement effect
	2007	2014	2014		2007	2014	2014	
AT	29958	37345	71051	33706	0.37	0.46	0.87	0.41
BE	23810	48735	42224	-6511	0.22	0.46	0.40	-0.06
DE	131402	165977	310020	144043	0.16	0.20	0.38	0.18
DK	3316	5492	6849	1358	0.06	0.10	0.13	0.03
ES	649076	1322727	1155400	-167328	1.45	2.96	2.59	-0.37
FI	1388	2123	2998	874	0.03	0.04	0.06	0.02
FR	43652	94756	73368	-21388	0.07	0.16	0.12	-0.04
GR	52567	84840	110236	25396	0.49	0.79	1.03	0.24
IE	24496	34728	54964	20236	0.56	0.80	1.26	0.46
IT	415893	748562	814316	65754	0.71	1.27	1.38	0.11
LU	1085	1946	2129	183	0.23	0.42	0.46	0.04
NL	11272	21341	21283	-58	0.07	0.13	0.13	0.00
SE	6280	10878	12614	1737	0.07	0.12	0.14	0.02
UK	40023	72384	78106	5722	0.07	0.12	0.13	0.01
BG	273506	408399	460295	51896	3.56	5.32	6.00	0.68
RO	1160713	2243435	2295262	51827	5.39	10.41	10.65	0.24
EU-15[1)]	**1434218**	**2651834**	**2755557**	**103723**	**0.38**	**0.71**	**0.73**	**0.03**
NMS-2	**1434218**	**2651834**	**2755557**	**103723**	**4.91**	**9.07**	**9.43**	**0.35**

1) Without Portugal.
Notes: The stock of foreign residents in 2007 is used as a benchmark. The status quo scenario refers to migration projections assuming that the transitional arrangements are prolonged, while the free movement scenario refers to projections which assume that free movement is introduced in the entire EU. Therefore the difference of the status quo and the free movement scenario is treated as the "free movement effect".

Sources: Own calculations and estimates.

Throughout our simulations, we have used the actual activity and employment rates of the immigrant population derived from the European Labour Force Survey (Eurostat, 2008) for the calculation of the labour supply shocks. Moreover, we used the skill and age composition of the immigrant workforce for the analysis of the labour market effects from the same data source. However, since migrants from the NMS are employed in occupations which do not correspond to their educational attainment, we made adjustments for the 'brain waste' in the receiving countries.

4.1.3 Accounting for differences between migrants' jobs and skills

For an empirically meaningful assessment of the migration impact, we have to make assumptions on the skill structure of the labour supply shock. As has been outlined in Background Report 2, the skill level of migrants from the NMS is higher than that of natives who stay behind in the sending countries, even if we control for cohort effects (see Background Report 2). We apply here the assumption that there is no selection with respect to unobservable abilities relative to the native population in the home countries, such that migrants from the NMS would be employed in their home countries similar to natives with the same skill levels and work experience.

In the receiving countries, the occupational structure of employment suggests that migrants from the NMS are employed below their educational levels: a large share of migrants is employed in occupations which need only elementary skills irrespective of their educational attainment. As a consequence, the wage level of migrants from the NMS in the UK is well below that of natives in the receiving countries with similar education and work experience (see Background Report 6 in this report, and Barret and Duffy, 2008 for evidence from Ireland). Moreover, the returns to education do not increase

significantly with the time spend in the receiving countries, although it is too early to ultimately assess the labour market assimilation of migrants from the NMS (Background Report 6). Overall, migrants from the NMS compete to a large extent in the less-skilled segments of the labour market with natives and other foreigners in the EU-15, although their educational attainment is relatively high.

Using the skill level of migrants from the NMS as reported in the Labour Force Survey would therefore bias our simulations of the migration impact. In order to avoid this, we have classified migrants according to their occupational breakdown, which has been related to the skill level of the workforce. As a result, we find much higher shares of migrants from the NMS in the group with low education, and much lower shares in the group with high education. This revised breakdown provides in our view a much better approximation of the skill structure of the labour supply shock from the NMS than the skill breakdown reported by the Labour Force Survey.

5 Assessing the Labour Market Effects: A Wage Curve Approach

The first model we apply here for the assessment of labour mobility on wages, employment and other macroeconomic variables is based on a framework which considers imperfect labour markets and unemployment. In contrast to the overwhelming share of the literature which addresses the wage and employment effects of labour migration separately, we analyse the wage and employment effects of migration simultaneously in a general equilibrium framework. We apply an aggregate wage curve approach for this purpose, which relies on the empirical observation that wages respond to changes in the unemployment rate, albeit imperfectly. This allows us to consider institutional and other labour market rigidities, which are particularly relevant in the European context.

The empirical framework is based on a nested production function grouping the labour force by education, experience, and national origin. The elasticities of the wage curve and of the production function are estimated. Moreover, we consider the adjustment of capital stocks and estimate the speed of adjustment empirically.

The analysis in this section is organised as follows: First, we outline the theoretical background (Section 5.1). Second, we describe the databases which are employed for the empirical analysis (Section 5.2). Third, we present the estimation strategy and the estimation results for the adjustment of capital stocks, the elasticities of the wage curve and of the production function (Section 5.3). Fourth, we simulate the employment and wage impact of migration on the receiving and sending countries in the enlarged EU (Section 5.4). Finally, Section 5.5 concludes.

5.1 Theoretical background

The labour market is modelled here in form of an aggregate wage curve. The wage curve is based on the empirical observation that wages decline when the employment rate

increases. This enables us to capture the employment and the wage effects of migration simultaneously in a joint framework (Boeri and Brücker, 2005; Brücker and Jahn, 2008; Levine, 1999).

The wage curve can be based on different theoretical foundations (see Blanchflower and Oswald, 1994; Layard et al., 1991, for a discussion). In our context, two modelling traditions are particularly important. First, the wage curve can be derived from bargaining models (see e.g. Layard and Nickell, 1986; Lindbeck, 1993), which assume that trade unions are concerned about both their employed and unemployed members. Consider the case where wages are fixed in a bilateral bargaining monopoly between trade unions and employer federations. Once wages are fixed, firms hire workers until the marginal product of labour equals the wage rate. Both parties that participate in the wage bargain are aware of this. Higher unemployment means that more union members are without work and that employed members who are dismissed will have a lower probability of finding new employment. Consequently, the negotiated wage is lower when unemployment is higher and vice versa.

Second, in a completely non-unionised environment, a wage curve can be explained by efficiency-wage considerations (Shapiro and Stiglitz, 1984), where the productivity of workers is linked to the wage level. Unemployment works here as disciplining device since it determines the difficulties in finding a new job. As a result, firms will reduce the remuneration of workers if the unemployment rate is increasing since they can achieve the same level of productivity at a lower wage if unemployment is higher.

Both approaches have in common that they replace the conventional labour supply curve by a wage fixing function and that they rely on standard assumptions about labour demand (Blanchflower and Oswald, 1995; Layard and Nickell, 1986). Bargaining and efficiency wage models may play different roles in different countries depending on their labour market institutions. Therefore we do not derive the wage curve from a specific wage bargaining or efficiency wage model here. We simply assume that a wage-fixing mechanism exists which responds to the unemployment rate, albeit imperfectly. Once wages are fixed, profit-maximising firms hire workers until the marginal product of labour equals the wage rate.

The production-side of the economy is modelled in form of a nested production function, which groups the labour force by education, experience, and national origin (see Borjas, 2003; Card and Lemieux, 2001; Ottaviano and Peri, 2006, for a similar approach). However, data limitations restrict the number of cells in the labour market. We distinguish three education groups, three experience groups, and native and foreign workers. We assume that the production function is characterised by a constant elasticity of substitution (CES) between the individual factors.

The production function determines the marginal product of labour. Since firms are free in their hiring decisions, it follows that profit-maximising firms hire workers until the wage rate equals the marginal product of labour. At the same time, the elasticity of the wage curve determines the relation between wages and the unemployment rate, and hence, both the wage and employment response to an exogenous labour supply shock.

This allows deriving the wage and employment response of the economy to the immigration of labour simultaneously.

The details of the model are described in Brücker and Jahn, 2008.

5.2 Data

An EU-wide data set which provides detailed information on wages, employment, and labour supply for larger time-series does not exist. Our empirical approach therefore follows the strategy to exploit both the existing data sources for the EU-15 and the new member states and empirical estimates on the elasticities of the production function for countries where more detailed data sets exist. For the EU-15 we use information from the European Community Household Panel (ECHP); for selected NMS, we use wage and labour force data which have been collected in the framework of the EU-KLEMS project.

The ECHP is a household survey which provides individual information on wages, the employment status, human capital characteristics such as education and work experience, and national origin. This information is used to estimate the elasticities of the aggregate production functions in the EU-15. Due to missing wage information we had to skip Sweden and Luxembourg from the panel. We use the unweighted average for the parameters in the remaining EU-15 for these two countries.

The data set has, however, a number of limitations: First, since it relies on survey information, particularly the measurement of wages is inaccurate. Measurement error can result in an attenuation bias, i.e. an underestimation of the inverse of the relevant elasticities. Second, the response rates for the immigrant community are low. This forces us to base our analysis on relatively broad categories. Still, the information suffers from insufficient information particularly in the foreigner cells. Third, the time dimension of the panel is limited. At a maximum we have eight observations over time, for a number of countries we have only six observations. However, since the elasticities of the production function are identified by fixed effects regressions, the time dimension is crucial for a proper identification.

Compared to the literature, studies in individual countries suffer from data limitations as well, but less than ours. The time dimension of the data sets in the US studies (e.g. Borjas, 2003; Ottaviano and Peri, 2006) is also limited to eight observations. But there we have decennial information from the population censuses and not annual information. The variance of the data is therefore higher in the US data bases. The existing German studies (Brücker and Jahn, 2008; D'Amuri et al., 2008; Felbermayr et al., 2008) are based on administrative data or household surveys with a longer time dimension and accurate wage information. The British study by Manacorda et al. (2006) is based on labour force survey data with similar measurement problems as our dataset but it has a larger time dimension and more observations than the ECHP.

Altogether, it is likely that our estimates of the elasticities of the production function suffer from an attenuation bias which can be traced back to the limitation of the data set employed. Nevertheless, the ECHP is the only available data source which provides the relevant information for most EU member states, i.e. information on wage levels,

employment status, and human capital characteristics of the workforce which we need for the identification of the elasticities of the production function. We therefore use the elasticities from the literature for a sensitivity analysis in our simulations.

The ECHP information is supplemented by information from other data sources. The wage curves are estimated on basis of aggregate wage and unemployment data provided by the Eurostat Labour Force Survey. This data series enables us to cover more information over time than the ECHP data.

The adjustment of capital stocks to labour supply shocks is measured on basis of internationally comparable capital stock data provided by the OECD. Finally, the simulations are based on the structure of employment and unemployment by natives and foreigners provided by the Eurostat Labour Force Survey (LFS) data. We use these data for the simulations since the picture on the employment structure is more accurate in the LFS data compared to the ECHP.

There exists no complete data set for the new member states which provides information on wages and employment status by education and experience. We therefore use for a selection of countries – Czech Republic, Hungary, Poland, and Slovakia – data on wages and employment provided by Vienna Institute for International Economic Comparisons (wiiw), which have been collected in the context of the EU KLEMS project. This data set provides information on wages, employment and unemployment by three education and three age groups. The data set contains no information by nationality. We thus focus in this country group on the impact of emigration on wages and employment, but do not consider the impact of immigration into these countries. Note that the foreigner share is rather small in these countries, such that the ignoring the different effects of emigration on native and foreign workers does not bias our results seriously.

For those NMS countries which are not covered by the data set, we use the unweighted average of the estimated parameters for the country sample described above. The structure of wages and employment by education and experience groups is also extrapolated from the average structure of the countries on which we have information. However, we use the available information on GDP and average wages for these countries for the evaluation of the wage and employment effects. Regarding the structure of wages across the different cells of the labour market we use again the unweighted average from the NMS countries for which information on the wage structure is available.

Time series on capital stocks are not available for the NMS. We therefore assume that capital stocks adjust in this country group to labour supply shocks at the average speed which we observe in the EU-15.

Altogether, data on wages and employment status in the different cells of the labour market is available only for a subsample of the EU-15 and NMS countries covered by our analysis. Moreover, the survey information used is subject to measurement error, which may in turn result in an attenuation bias. Although we may overestimate the elasticity of substitution across the different cells of the labour market, the available time-series may allow us to identify both the average elasticity of the wage curves properly as well as the adjustment of capital stocks to labour supply shocks. Thus, while our analysis may be distorted in individual cells of the labour market, this kind of analysis may provide a

reasonable picture of the overall trends in the economies involved. Moreover, as a robustness check, we use elasticities estimated by other studies for a sensitivity analysis.

5.3 Estimation results

The simulation of the model requires three sets of parameters: Estimates of the adjustment of capital stocks to labour supply shocks, estimates of the elasticity of the wage curve and estimates of the elasticity of substitution between the factors of production.

5.3.1 Adjustment of capital stocks

Following Ottaviano and Peri (2006), we estimate the adjustment of the capital-labour ratio as

$$\ln \kappa_t = \beta_0 + \beta_1 \ln \kappa_{t-1} + \beta_2 \ln \kappa_{t-2} + \beta_3 TREND_t + \gamma \Delta \ln L_t + \varepsilon_t , \qquad (1)$$

where κ_t is the capital-labour ratio, $TREND_t$ a deterministic time trend, L_t the labour force, ε_t the error term, and Δ the difference operator, β and γ coefficients and t the time index. The numbers of lags of the dependent variable which are included have been chosen by significance level of the respective lag.

Thus, equation (1) is a dynamic model, where the short-run impact of the labour supply shocks, $\Delta \ln L_t$, is captured by the estimate of the parameter γ. Other factors which may affect the capital-labour ratio are captured by the deterministic time trend. The interpretation of the coefficient γ is straightforward: a coefficient of -1 implies that the capital-labour ratio declines by 1 per cent if the labour force grows by 1 per cent, which corresponds to the case where the capital stock is fixed. The size of the coefficients on the lagged capital output ratio determines the speed of adjustment to capital-labour ratio before the labour supply shock.

Note that the unit-root tests indicate that the capital-labour ratio is stationary, while the labour force is a non-stationary I(1) variable. This can be interpreted as support for the theoretical assumption that labour supply shocks have a short-run but not a long-run impact on the capital-labour ratio.

Since the labour force might be endogenous, we have estimated equation (1) both with OLS and Two-Stage-Least Squares. In the later regression we have used the first and second lag of the change of the labour force as instruments.

Table 5: Adjustment of the capital-labour ratio in EU countries

	OLS-Regressions							IV-Regressions						
	$\Delta \ln L_t$		$\ln k_{t-1}$		$\ln k_{t-2}$		adj. R^2	$\Delta \ln L_t$		$\ln k_{t-1}$		$\ln k_{t-2}$		adj. R^2
	coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.		coeff.	t-stat.	coeff.	t-stat.	coeff.	t-stat.	
AT	-0.13	-0.37	0.87 ***	29.34	-	-	0.998	-0.17	-0.49	0.82 ***	20.91	-	-	0.998
BE	-0.58 ***	-3.11	0.99 ***	20.78	-	-	0.999	-0.57 ***	-2.93	0.99 ***	18.86	-	-	0.999
DK	-0.64 ***	-2.83	0.96 ***	13.76	-	-	0.998	-0.69 ***	-2.95	0.97 ***	13.74	-	-	0.998
FIN	-0.90 ***	-11.73	0.96 ***	39.40	-	-	0.998	-0.90 ***	-11.73	0.96 ***	39.40	-	-	0.997
FR	-0.40 ***	-3.60	0.95 ***	73.47	-	-	1.000	-0.41 ***	-3.83	0.93 ***	63.76	-	-	0.998
DE	-0.80 ***	-10.72	0.93 ***	33.04	-	-	0.999	-0.83 ***	-10.62	0.96 ***	26.58	-	-	0.999
GR	-0.80 ***	-3.96	1.45 ***	9.67	-0.53 ***	-4.50	0.998	-0.81 ***	-3.92	1.46 ***	9.51	-0.53 ***	-4.41	0.997
IE	-0.84 ***	-6.37	0.90 ***	7.39	-0.21 *	-1.83	0.997	-0.84 ***	-6.31	0.91 ***	7.36	-0.21 *	-1.87	0.997
IT	-0.72 ***	-7.15	0.89 ***	35.02	-	-	1.000	-0.69 ***	-5.85	0.89 ***	23.17	-	-	0.992
NL	-0.61 **	-2.71	0.78 ***	10.94	-	-	0.960	-0.64 **	-2.69	0.74 ***	7.96	-	-	0.942
PT	-0.86 **	-2.75	0.86 ***	10.14	-	-	0.991	-0.86 **	-2.75	0.86 ***	10.14	-	-	0.987
SP	-0.72 ***	-7.38	0.91 ***	39.24	-	-	0.999	-0.71 ***	-7.53	0.88 ***	35.64	-	-	0.999
SWE	-0.49 ***	-4.38	1.29 ***	10.22	-0.33 **	-2.58	0.999	-0.49 ***	-4.27	1.28 ***	10.07	-0.33 **	-2.54	0.999
UK	-0.80 ***	-8.80	0.86 ***	16.26	-	-	1.000	-0.80 ***	-8.45	0.86 ***	14.84	-	-	0.995
EU-14	-0.66 ***	-15.47	0.95 ***	123.1	-	-	0.999	-0.65 ***	-14.77	0.95 ***	129.85	-	-	0.997

Dependent variable is $\ln \kappa_t$.-- ***,**,* denote the significance at the 1-, 5-, and 10-per cent level, respectively.-- The country regressions cover 38 observations (1 lag) or 37 observations (2 lags).-- Each regressions includes a constant and a deterministic time trend.-- The IV-regressions use the first and the second lag of the log change of the labour force as instruments.-- The panel regressions is estimated with GLS allowing for heteroscedastic disturbances.

The regression results are displayed in Table 5. We find that the estimated coefficient γ varies in most countries between -0.6 and -0.9, indicating that capital stocks adjust already in the first period. We have two outliers – Austria and France – where the estimated coefficients for the parameter γ are very small and suggest that the capital stocks adjust already in the first period largely to labour supply shocks. The coefficients for the lagged dependent variable (or the sum of the lagged dependent variable) vary in most regressions between 0.7 and 0.95, indicating that between 5 and 30 per cent of an initial shock on the capital-labour ratio disappears within one year.

Altogether we find strong evidence that capital stocks adjust to labour supply shocks and that these adjustment processes are rather fast in most countries, although the results differ for the individual countries.

In our simulations we apply the estimated coefficients for the individual EU-15 countries. For the NMS, where long time series for capital stocks do not exist, we apply the panel estimate of the coefficients for the EU-15 as parameters in our simulations. This yields an estimate of -0.65 for the parameter γ, and one of 0.95 for the lagged capital-labour ratio.

5.3.2 Estimates of the wage curve

The wage curve is usually estimated either at the regional or at the sectoral level (Blanchflower and Oswald, 1994; 2005). However, there also exist a number of estimates at the national level (see Card and David, 1995, for a detailed discussion and Guichard and Laffargue, 2000, for a recent contribution). Since we want to identify the macro impact of the adjustment of wages to the unemployment rate we follow here the national level approach (see Brücker and Jahn, 2008, for a detailed discussion).

More specifically, we estimate

$$\ln w_t = \beta_0 + \beta_1 \ln w_{t-1} + \beta_2 \ln w_{t-2} + \beta_3 TREND_t + \eta \ln u_t + \varepsilon_t , \qquad (2)$$

where w_t is the wage rate, $TREND_t$ a deterministic time trend, u_t the unemployment rate, ε_t the error term, β and η coefficients and t as before the time index. The numbers of lags of the dependent variable which are included have been chosen by significance level of the respective lag. Following the literature (Blanchflower and Oswald, 1994; 2005) we estimate equation (2) with two-stage-least-squares using the first and the second lag of the unemployment rate as instruments.

Our findings are displayed in Table 6. Our estimates vary country by country and are not completely robust with regard to the lag specification of the model. We therefore decided to use the more robust panel estimate for the EU-15 for our simulations. This yields a long-run elasticity of -0.13 for the aggregate wage curve. This is slightly higher than the elasticity of -0.1 which is found in large parts of the regional level literature (Blanchflower and Oswald, 1995; 2005; Longhi et al., 2005). However, this is not surprising in our view, since we estimate here the macro response of wages to changes in the unemployment rate rather than the regional wage response to changes in the regional unemployment rate. In case of centralised wage bargaining it is however rather likely that the macro response exceeds the regional response.

For the new member states we have only short time series between 10 and 15 years, making it difficult to identify the wage curve. We find a rather large elasticity of -0.26 for the NMS. However, this may be influenced by the transitional recession and not robust due to structural breaks. We therefore employed the wage curve which we found in the panel estimate for the EU-15 in our simulations also for the NMS.

Table 6: Estimate of the dynamic wage curve model

dependent variable: $\ln(w_{it})$	$\ln(w_{i,t-1})$		$\ln(w_{i,t-2})$		$\ln(u_{i,t-1})$			regression diagnostics	
					short-run		long-run		
country	coeff.	se	coeff.	se	coeff.	se	coeff.	adj. R^2	obs.
Austria	0.80 ***	0.07	-		-0.013	0.01	-0.063	0.998	36
Belgium	0.83 ***	0.12	-0.49 ***	0.13	-0.017	0.01	-0.025	0.999	35
Denmark	0.51 **	0.19	0.07	0.18	-0.002	0.07	-0.004	0.995	36
Finland	0.76 ***	0.11	-		-0.022 **	0.01	-0.092	0.993	36
France	1.75 ***	0.09	-0.80	0.10	-0.014 *	0.04	-0.320	0.997	35
Germany	0.19	0.13	-		-0.067 ***	0.01	-0.083	0.997	15
Greece	0.83 ***	0.08			-0.033	0.02	-0.197	0.927	36
Ireland	0.77 ***	0.13			-0.008	0.02	-0.034	0.999	34
Italy	0.54 ***	0.16	-		-0.052 *	0.03	-0.113	0.999	36
Luxembourg	0.35 ***	0.17	-		-0.064 **	0.02	-0.099	0.958	36
Netherlands	1.56 ***	0.11	-0.62 ***	0.11	-0.015	0.02	-0.221	0.999	35
Portugal	0.51 ***	0.16	-		-0.063 ***	0.02	-0.129	0.999	11
Spain	0.87 ***	0.07			-0.033 **	0.01	-0.243	0.991	36
Sweden	0.79 ***	0.10	-		-0.050 ***	0.01	-0.238	0.998	36
United Kingdom	0.67 ***	0.10	-		-0.028 **	0.01	-0.086	0.994	36
EU-15	0.93 ***	0.01			-0.009 ***	0.00	-0.130	0.988	498
NMS-10	0.69 ***	0.06			-0.083 ***	0.02	-0.269	1.00	99

***, **, * denote the significance at the 1 per cent, 5 per cent and 10 per cent level, respectively.-- In each regressio the unemployment rate ist instrumented with the first and the second lag of the unemployment rate.-- All regressions include a deterministic time trend and a squared deterministic time trend.-- We report White-heteoscedastic consistent standard errors in the fixed effects regressions.-- The F-test rejects the Null hypothesis of no country specfic fixed effects.

5.3.3 Estimates of the elasticities of substitution

The simulation of the model presented above requires the estimation of the elasticities of substitution between labour of different education groups, of different experience groups and natives and foreigners. We have estimated these elasticities step by step on basis of the ECHP data. In case of the NMS as emigration countries with a rather small foreigner share we have not estimated the elasticity of substitution between natives and foreigners.

The results are displayed in Table 7. In most countries the elasticities of substitution have the expected signs. It is worthwhile noting that our findings confirm the suggestion by Ottaviano and Peri (2006) that natives and foreigners are imperfect substitutes in the labour market. However, the coefficients which we have estimated are quite small, indicating a high elasticity of substitution between natives and foreigners.

Table 7: Estimates of the inverse elasticity of substitution

		Between education groups	Between experience groups	Between natives and immigrants
EU-15	AT	0.04	0.02	0.08
	BE	0.08	0.02	0.07
	DE	0.00	0.05	0.11
	DK	0.02	-0.11	0.02
	ES	0.50	0.00	0.00
	FI	0.05	0.03	0.07
	FR	0.02	0.16	0.00
	GR	0.24	0.04	0.12
	IE	0.21	0.04	0.01
	IT	0.03	0.07	0.08
	LU	0.12	0.04	0.04
	NL	0.12	0.04	0.04
	SE	0.12	0.04	0.04
	UK	0.23	0.05	0.06
NMS-8	CZ	0.04	0.13	--
	EE	0.05	0.06	--
	HU	0.08	0.10	--
	LT	0.05	0.06	--
	LV	0.05	0.06	--
	PL	0.06	0.01	--
	SI	0.05	0.06	--
	SK	0.03	0.02	--
NMS-2	BG	0.05	0.06	--
	RO	0.05	0.06	--

Sources: Own estimates based on ECHP data and the EU KLEMS data.

We have therefore compared our findings with those of the literature (see Table 8). The inverse elasticities found in other studies are on average larger than those obtained by us, particularly those in the US studies. However, many results in the European studies look relatively similar to our findings. As a robustness check, we have employed the largest elasticities found in the literature in a sensitivity analysis. Employing these elasticities does not change our findings qualitatively and quantitatively to a large extent with one exception: The size of the elasticity of substitution between native and foreign labour can change results in an important way. Beyond this caveat, our simulations are rather robust. The sensitivity analysis is available from the authors upon request.

Table 8: Estimates of the inverse elasticity of substitution: a literature review

		Between education groups		Between age or experience groups		Between natives and immigrants	
	Country	Min	Max	Min	Max	Min	Max
Aydemir and Borjas (2007)	CA	0.05	0.42	0.03	0.14	-0.02	-
Card and Lemieux (2006)	CA	0.13	0.28	0.16	0.17	-	-
Bruecker and Jahn (2008)	DE	0.15	0.31	0.03	0.06	0.01	0.13
D'Amuri, Ottaviano and Peri (2008)	DE	-	-	-	-	0.05	0.06
Felbermayr, Geis and Kohler (2008)	DE	0.22	0.24	-0.02	0.06	0.06	0.12
Fitzenberger, Garloff and Kohn (2004)	DE	0.11	0.09	0.09	0.03	-	-
Amuedo-Dorantes and de la Rica (2008)	ES	0.65	0.69	0.22	0.34	-	-
Aydemir and Borjas (2007)	MEX	0.36	2.02	0.23	0.29	-	-
Card and Lemieux (2001)	UK	0.34	0.42	0.23	0.26	-	-
Manacorda, Manning and Wadsworth (2006)	UK	0.09	0.17	0.10	0.11	0.15	0.36
Aydemir and Borjas (2007)	US	0.27	0.33	0.12	0.32	-0.01	-
Borjas (2003)	US	0.29	-	0.74	0.76	-	-
Card and Lemieux (2006)	US	0.33	0.48	0.20	0.27	-	-
Ottaviano and Perri (2006)	US	0.38	0.54	0.16	0.30	0.07	0.27
Bruecker and Jahn (2008, unpublished)	UK	0.23	-	0.05	0.06	0.04	0.09

Sources: Own presentation based on the studies quoted above.

5.4 Simulation results

We simulate first the impact of the EU Eastern enlargement on migration between the NMS-8 and the EU-15 during the 2004 to 2007 period, and then the impact of migration between the NMS-2 and the EU-15 during the same period of time. In each scenario we distinguish between the short-run and the long-run effects of migration. In the short-run scenario we assume that the capital-labour ratio adjusts as estimated by equation (1), in the long-run scenario we assume that the capital stock adjusts completely to the increasing labour supply.

In all scenarios we have calculated the following effects:

- First, the impact of migration on aggregate GDP, on GDP per capita and the total factor income per native. The first variable captures the overall effect on output and the second one the output effect per capita. Both indicators should not be misunderstood as welfare indicators. They do in particular not capture whether natives in the receiving countries lose or gain. The third indicator comprises the total factor income of the native population based on the assumptions that migrants do not bring capital and that natives own the entire capital stock of the economy. Under these strong assumptions, this is an indication for the change in total earnings of the native population.

- Second, we have calculated the aggregate effects on the labour market. This covers the wage rate and the aggregate unemployment rate.

- Third, we have analysed the wage and unemployment effects in detail for different groups in the labour market, distinguishing between high-, medium- and low-skilled workers.

5.4.1 The impact of Eastern enlargement on the UK and Germany, 2004-2007

Based on the detailed estimation of the parameters, including the elasticities of the wage-setting curves for different education and experience groups in the labour market, we have first simulated the impact of Eastern enlargement on the UK and Germany. According to our scenarios, Eastern enlargement involves an increase in the labour force through immigration from the NMS-8 of about 1.3 per cent in the UK, but only of 0.1 per cent in Germany. The immigration from the NMS-2 is negligible in both countries.

Our simulation results indicate that the immigration from the NMS will decrease the GDP per capita in the UK by about 0.34 per cent in the short-run while the long-run effect is almost neutral. The short-run decrease can be attributed to the fact that migrants do not bring capital. However, the factor income of the native population, i.e. the income of native labour and capital, will increase by 0.31 per cent in the long-run and only slightly decline by 0.06 per cent in the short-term. Wages, however, decline in the short-run by about 0.29 per cent and unemployment increases by about 0.26 percentage points in the short-run. In the long-run, when capital stocks have adjusted, the wage impact is zero while the unemployment rate is slightly increasing by 0.18 percentage points. The results for Germany display a similar picture, but are much smaller due to the lower immigration.

We find that the effects are very balanced across the different groups of the labour force in the UK and Germany, with the notable exception of workers with no vocational training. In the UK, these workers are much more affected by declining wages in the short-term (-0.67) compared to workers with vocational training (-0.23), a high school (-0.27) or a university degree (-0.26). In the long-run, these effects diminish (Table 9). Similarly, the unemployment rate of workers with no vocational training tends to increase more than that of other workers. In the long-run, the unemployment rate remains by and large unchanged for all groups in the labour market in the UK, except for workers with no vocational training. It is also important to note that the native workforce tends to win from migration slightly in the long-run both in terms of higher wages and lower unemployment risks, while the foreign workforce loses substantially (Table 9).

It is worthwhile to note that the ceteris paribus condition applies for these results, i.e. that other currents may affect wages and the unemployment rate in one direction or another. In fact, unemployment has increased in the UK slightly by about 0.5 percentage points from 2004 to 2007 which is in the range of normal fluctuations which we observe since the beginning of this decade and before the financial crisis began. We thus conclude that our findings are by and large consistent with actual developments. However, the unemployment rate of the foreign workforce has increased by less than 0.5 percentage points during the simulation period, i.e. by much less than our simulation results suggest. Again, the findings presented here do not predict the actual development of the unemployment rate or wage growth for certain groups in the labour market, but the potential impact of migration under the assumption that anything else is equal and that the values of the parameters of our structural model remain constant.

Table 9: The impact of Eastern enlargement on the UK and Germany, 2004-2007

	NMS-8				NMS2			
	Germany		United Kingdom		Germany		United Kingdom	
	Short-run	Long-run	Short-run	Long-run	Short-run	Long-run	Short-run	Long-run
	Changes in per cent (unemployment rate: changes in percentage points)							
	Macro figures							
Change of labour force	0.10	0.10	1.28	1.28	0.04	0.04	0.07	0.07
GDP	0.01	0.07	0.44	0.81	0.00	0.03	0.03	0.05
GDP per capita	-0.07	-0.01	-0.34	0.03	-0.02	0.00	-0.01	0.01
Factor income per native	-0.03	0.03	-0.06	0.31	-0.01	0.01	0.00	0.02
Unemployment	0.04	0.02	0.26	0.18	0.02	0.01	0.01	0.01
Wages	-0.03	0.00	-0.29	0.00	-0.01	0.00	-0.01	0.00
	Wages by education							
All	-0.03	0.00	-0.29	0.00	-0.01	0.00	-0.01	0.00
No vocational	-0.07	-0.04	-0.67	-0.38	-0.03	-0.02	-0.04	-0.02
Vocational	-0.03	0.00	-0.23	0.06	-0.01	0.00	-0.01	0.00
High school	-0.03	0.00	-0.27	0.02	-0.01	0.00	-0.01	0.00
University	-0.03	0.00	-0.26	0.05	-0.01	0.00	-0.01	0.00
	Native wages by education							
All natives	-0.02	0.00	-0.24	0.05	-0.01	0.00	-0.01	0.00
No vocational	-0.04	-0.01	-0.52	-0.23	-0.01	0.00	-0.03	-0.01
Vocational	-0.02	0.01	-0.20	0.09	-0.01	0.00	-0.01	0.00
High school	-0.03	0.00	-0.21	0.08	-0.01	0.00	-0.01	0.00
University	-0.02	0.01	-0.20	0.10	-0.01	0.00	-0.01	0.01
	Non-native wages by education							
All non-natives	-0.07	-0.04	-0.89	-0.60	-0.03	-0.02	-0.05	-0.03
No vocational	-0.12	-0.09	-4.45	-4.17	-0.04	-0.03	-0.25	-0.23
Vocational	-0.04	-0.02	-0.85	-0.56	-0.02	-0.01	-0.05	-0.03
High school	-0.07	-0.04	-0.75	-0.47	-0.02	-0.01	-0.04	-0.03
University	-0.07	-0.03	-0.62	-0.31	-0.03	-0.02	-0.03	-0.02
	Unemployment by education							
All	0.04	0.02	0.26	0.18	0.02	0.01	0.01	0.01
No vocational	0.10	0.06	1.02	0.92	0.04	0.02	0.06	0.05
Vocational	0.03	0.00	0.15	0.06	0.01	0.00	0.01	0.00
High school	0.03	0.01	0.14	0.04	0.01	0.00	0.01	0.00
University	0.01	0.00	0.04	0.02	0.01	0.00	0.00	0.00
	Native unemployment by education							
All natives	0.02	0.00	0.07	-0.01	0.01	0.00	0.00	0.00
No vocational	0.05	0.02	0.18	0.08	0.02	0.01	0.01	0.00
Vocational	0.02	-0.01	0.06	-0.02	0.01	0.00	0.00	0.00
High school	0.01	0.00	0.07	-0.02	0.00	0.00	0.00	0.00
University	0.01	0.00	0.01	-0.01	0.00	0.00	0.00	0.00
	Non-native unemployment by education							
All non-natives	0.11	0.07	1.69	1.59	0.04	0.03	0.11	0.10
No vocational	0.17	0.13	5.58	5.47	0.07	0.05	0.63	0.62
Vocational	0.07	0.03	1.30	1.18	0.03	0.01	0.09	0.08
High school	0.09	0.06	0.40	0.22	0.03	0.02	0.02	0.01
University	0.05	0.03	0.06	0.02	0.02	0.01	0.00	0.00

Source: Own estimates and simulation, see text.

5.4.2 The impact of Eastern enlargement on the EU-25, 2004-2007

Table 10 presents the impact of migration from the NMS-8 to the EU-15 caused by Eastern enlargement on GDP during the 2004-2007 period. We find that immigration from the NMS-8 increases the GDP of the enlarged EU in the short-run by about 0.11 per

cent and in the long-run, after the adjustment of capital stocks, by about 0.20 per cent. While the GDP in the EU-15 increases by about 0.26 per cent it falls in the NMS-8 by about 1.10 per cent in the long-run. This is not surprising since the first group of countries receives additional labour and, after the adjustment of capital stocks, additional capital. The reverse holds for the sending countries.

The impact of migration on the GDP per capita is largely influenced by two factors: First, since immigrants do not bring physical capital by assumption, the capital endowment per capita falls in the receiving and increases in the sending countries in the short-term. In the long-term, when capital stocks adjust to changes in the labour supply, this effect disappears. Second, the rate of participation in the labour market is higher among the migrant population compared to the population average in the receiving countries. As a consequence, the GDP per capita tends to rise in the receiving countries. Our simulations demonstrate that the GDP per capita tends to increase in the sending countries in the short-term, while it remains largely constant in the receiving countries.

Table 10: The macroeconomic impact of migration from the NMS-8, 2004-2007

	Change of labour	GDP		GDP per capita		Factor income per native		Unemployment		Wages	
		Short-run	Long-run	Short-run	Long-run	Short-run	Long-run	Short-run	Long-run	Short-run	Long-run
		Changes in per cent (unemployment rate: changes in percentage points)									
AT	0.42	0.31	0.34	0.00	0.02	0.12	0.15	0.02	0.02	-0.02	0.00
BE	0.22	0.11	0.17	-0.08	-0.02	0.01	0.07	0.07	0.05	-0.04	0.00
DE	0.10	0.04	0.10	-0.03	0.02	-0.01	0.04	0.03	0.01	-0.03	0.00
DK	0.23	0.13	0.20	-0.08	-0.01	0.00	0.07	0.02	0.00	-0.05	0.00
ES	0.19	0.03	0.11	-0.08	-0.01	-0.04	0.04	0.05	0.02	-0.04	0.00
FI	0.09	0.03	0.08	-0.06	-0.01	-0.02	0.04	0.03	0.01	-0.03	0.00
FR	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GR	-0.01	0.00	-0.01	0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.00
IE	4.87	0.80	2.93	-2.07	-0.02	-0.77	1.31	0.87	0.37	-1.61	0.00
IT	0.11	0.04	0.08	-0.03	0.01	0.00	0.04	0.02	0.01	-0.03	0.00
LU	1.00	0.81	1.13	0.23	0.55	0.34	0.65	0.12	0.05	-0.25	0.00
NL	0.14	0.09	0.12	-0.03	-0.01	0.02	0.04	0.02	0.01	-0.02	0.00
SE	0.38	0.25	0.33	-0.01	0.07	0.05	0.12	0.05	0.03	-0.06	0.00
UK	1.28	0.50	0.89	-0.28	0.10	-0.05	0.34	0.21	0.11	-0.29	0.00
CZ	-0.08	-0.07	-0.11	0.01	-0.03	0.01	-0.03	-0.02	0.00	0.03	0.00
EE	-0.21	-0.09	-0.19	0.12	0.02	0.12	0.02	-0.04	0.00	0.06	0.00
HU	-0.44	-0.34	-0.49	0.10	-0.04	0.10	-0.04	-0.04	0.00	0.11	0.00
LT	-1.14	-0.55	-1.15	0.61	-0.01	0.61	-0.01	-0.32	-0.01	0.31	0.00
LV	-0.43	-0.26	-0.46	0.17	-0.03	0.17	-0.03	-0.09	0.00	0.12	0.00
PL	-1.77	-0.88	-1.94	0.90	-0.18	0.90	-0.18	-0.59	0.03	0.43	0.00
SI	0.26	0.15	0.21	-0.10	-0.05	-0.10	-0.05	0.02	0.00	-0.04	0.00
SK	-1.34	-0.53	-1.51	0.82	-0.18	0.82	-0.18	-0.55	0.00	0.43	0.00
EU-15[1)]	**0.36**	**0.13**	**0.26**	**-0.09**	**0.03**	**-0.02**	**0.10**	**0.06**	**0.02**	**-0.09**	**0.00**
NMS-8	**-1.16**	**-0.52**	**-1.10**	**0.65**	**0.05**	**0.65**	**0.05**	**-0.42**	**-0.02**	**0.25**	**0.00**
Total	**0.11**	**0.11**	**0.20**	**0.11**	**0.20**	**0.16**	**0.25**	**-0.03**	**0.00**	**-0.07**	**0.00**

1) Without Portugal.

Source: Own estimates and simulation, see text.

More importantly, the total gross factor income of natives in the receiving countries is increasing in the long-run. Several factors contribute to this fact. First, natives in the sending countries tend to benefit from migration if they differ in their factor endowments (human capital, physical capital) from the migrant population. However, if the unemployment rate is increasing, the effects on the aggregate income of natives are ambiguous. When capital adjusts in the longer term, adverse shocks on employment are

mitigated and total factor income increases with a larger capital stock. The converse holds for the sending countries.

It is important to note in this context that our calculation of the gross factor income per native is based on the assumption that the capital stock of the economy is owned by the native population. This is a strong assumption since we may have an inflow of foreign capital and savings by the migrant population. In the first case some of the additional income may flow abroad and in the second case to the migrant population. Nevertheless, since it is likely that most of the investment is undertaken by natives, this approximation does not distort the picture largely.

Under the assumptions of our simulations, the total factor income of the native population increases by 1.3 per cent in Ireland and by 0.3 per cent in the UK in the long-run. In the short-run, the factor income of the native population declines slightly in the UK and, reflecting the labour supply shock of 5 per cent, by 0.8 per cent in Ireland. With the exception of Luxembourg, the impact on the other receiving countries is negligible. Depending on the scale of the emigration shock in the NMS-8, the total factor income of the native population declines in the long-run when capital stocks have adjusted.

In the short-run, the unemployment in the receiving countries increases by 0.06 percentage points, while it remains stable after the adjustment of capital stocks. In the countries mainly affected, our simulations suggest that the unemployment rate may increase by 0.2 percentage points in the UK and 0.9 percentage points in Ireland in the short-run. In the long-run, the unemployment rate increases by 0.1 percentage points in the UK and 0.4 percentage points in Ireland.

In contrast to these results, we do not find any visible increase in the unemployment rate in Ireland in the course of the EU's Eastern enlargement despite the substantial influx of migrants there. This may be traced back to a faster adjustment of the capital stock than assumed by our model or by other adjustment mechanisms not considered by our model such as international trade.

We find that the unemployment rate is declining in the sending countries as a consequence of the outflow of labour. The same holds true for the entire EU since migrants tend to move out of countries or regions with an unemployment rate at or above the average level of the enlarged EU and move to countries having unemployment rates below the EU average.

In our model, migration affects aggregate wages only in the short-run, since aggregate factor proportions remain unchanged in the long-run due to the adjustment of capital stocks. At the average of the EU-15, wages decline slightly by 0.1 per cent, but increase in the sending countries by 0.3 per cent in the short-run. Again, Ireland is at a wage decrease of 1.6 per cent the most affected country, while the wage decreases are at 0.3 per cent in the UK and Luxembourg and only limited in the other affected countries. In contrast, depending on the outflow, wages increase by 0.4 per cent in Poland and Slovakia in the short-run, such that migration contributed slightly to the wage convergence there. Nevertheless, the wage impact is rather moderate and cannot be felt in most receiving and sending countries.

Migration affects the different groups in the labour market in different ways. We have therefore analysed how the different groups are affected in terms of their wages and unemployment risks. Table 11 displays the wage effects by skill group. We find that low- and medium skilled workers are slightly more affected by declining wages in the EU-15 (-0.10 and -0.09 per cent) compared to high-skilled workers (-0.07 per cent) in the short-run. In the long-run, we find that migration from the NMS-8 reduces wages of the low- and medium-skilled by only 0.01 per cent, and increases wages of high-skilled by 0.02 per cent. This pattern reflects the high concentration of migrant workers from the NMS at the low and medium skill spectrum and that migrants from the NMS are employed well below their reported skill levels.

Table 11: The impact of migration from the NMS-8 on wages, 2004-2007

	All		Low-skilled		Medium-skilled		High-skilled	
	Short-run	Long-run	Short-run	Long-run	Short-run	Long-run	Short-run	Long-run
				Changes in per cent				
AT	-0.02	0.00	-0.02	0.00	-0.02	0.00	-0.02	0.00
BE	-0.04	0.00	-0.03	0.01	-0.03	0.00	-0.05	-0.01
DE	-0.03	0.00	-0.03	0.00	-0.03	0.00	-0.03	0.00
DK	-0.05	0.00	-0.05	0.00	-0.05	0.00	-0.05	0.00
ES	-0.04	0.00	-0.03	0.01	-0.14	-0.09	-0.01	0.04
FI	-0.03	0.00	-0.03	0.00	-0.03	0.00	-0.03	0.00
FR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IE	-1.61	0.00	-1.72	-0.19	-1.84	-0.23	-1.34	0.30
IT	-0.03	0.00	-0.03	0.00	-0.03	0.00	-0.03	0.00
LU	-0.25	0.00	-0.13	0.12	-0.14	0.11	-0.63	-0.38
NL	-0.02	0.00	-0.02	0.00	-0.02	0.00	-0.03	0.00
SE	-0.06	0.00	-0.05	0.01	-0.05	0.01	-0.08	-0.02
UK	-0.29	0.00	-0.35	-0.07	-0.35	-0.06	-0.19	0.11
CZ	0.03	0.00	0.03	0.00	0.02	0.00	0.03	0.01
EE	0.06	0.00	0.07	0.01	0.06	0.00	0.06	0.00
HU	0.11	0.00	0.09	-0.01	0.10	-0.01	0.12	0.01
LT	0.31	0.00	0.32	0.02	0.30	-0.01	0.33	0.01
LV	0.12	0.00	0.11	0.00	0.11	-0.01	0.13	0.01
PL	0.43	0.00	0.41	0.01	0.39	-0.03	0.51	0.06
SI	-0.04	0.00	-0.06	-0.02	-0.04	0.00	-0.03	0.01
SK	0.43	0.00	0.36	-0.02	0.41	-0.02	0.49	0.05
EU-15[1)]	**-0.09**	**0.00**	**-0.10**	**-0.01**	**-0.09**	**-0.01**	**-0.07**	**0.02**
NMS-8	**0.25**	**0.00**	**0.23**	**0.00**	**0.23**	**-0.02**	**0.30**	**0.03**
Total	**-0.07**	**0.00**	**-0.09**	**-0.01**	**-0.08**	**-0.01**	**-0.06**	**0.03**

1) Without Portugal.

Source: Own estimates and simulation, see text.

In the NMS-8, high-skilled natives benefit more from emigration (+0.30 per cent) than less- and medium-skilled workers (+0.23 per cent each) in the short-run. In the long-run, wages of the high-skilled increase by 0.03 per cent, while the wages of the medium-skilled decline by 0.02 per cent. This can be traced back to the fact that the labour supply in the medium range of the skill spectrum is substantially larger in the NMS-8 compared to the EU-15, such that the composition of the migrant workforce changes labour endowments in the receiving and the sending countries in different ways (Table 11).

Finally, Table 12 displays the effects of migration from the NMS-8 on the unemployment risks of different groups in the labour market. Immigration from the NMS-8 increases the unemployment rate of less-skilled workers in the EU-15 by 0.07 percentage points, of medium-skilled workers by 0.06 percentage points, and of high-skilled workers by 0.02 percentage points. In the long-run, the impact of immigration on employment is largely neutral. A measurable impact is only found in Ireland. Note that it is rather likely that a larger part of the increasing unemployment risk is absorbed by the migrant population and not by natives.

Table 12: The impact of migration from the NMS-8 on unemployment, 2004-2007

	All		Low-skilled		Medium-skilled		High-skilled	
	Short-run	Long-run	Short-run	Long-run	Short-run	Long-run	Short-run	Long-run
	Changes in percentage points							
AT	0.02	0.02	0.03	0.02	0.01	0.00	0.09	0.09
BE	0.07	0.05	0.09	0.06	0.08	0.06	0.03	0.02
DE	0.03	0.01	0.04	0.01	0.02	0.00	0.03	0.02
DK	0.02	0.00	0.03	0.00	0.01	0.00	0.03	0.01
ES	0.05	0.02	0.04	0.00	0.16	0.12	0.01	-0.02
FI	0.03	0.01	0.04	0.00	0.04	0.01	0.02	0.01
FR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IE	0.87	0.37	1.32	0.57	0.86	0.43	0.31	-0.01
IT	0.02	0.01	0.02	0.01	0.02	0.01	0.01	0.00
LU	0.12	0.05	0.04	-0.04	0.04	-0.02	0.47	0.40
NL	0.02	0.01	0.03	0.02	0.01	0.01	0.01	0.00
SE	0.05	0.03	0.08	0.05	0.04	0.02	0.07	0.05
UK	0.21	0.11	0.29	0.14	0.25	0.16	0.04	-0.02
CZ	-0.02	0.00	-0.11	-0.07	-0.01	0.00	0.00	0.00
EE	-0.04	0.00	-0.08	-0.01	-0.05	0.00	-0.02	0.00
HU	-0.04	0.00	-0.10	0.00	-0.04	0.00	-0.01	0.00
LT	-0.32	-0.01	-0.61	-0.11	-0.33	0.01	-0.15	0.00
LV	-0.09	0.00	-0.14	-0.02	-0.09	0.00	-0.05	0.00
PL	-0.59	0.03	-1.12	-0.23	-0.61	0.06	-0.26	0.00
SI	0.02	0.00	0.05	0.02	0.02	0.00	0.01	0.00
SK	-0.55	0.00	-1.55	-0.21	-0.52	0.00	-0.28	-0.12
EU-15[1)]	**0.06**	**0.02**	**0.07**	**0.03**	**0.06**	**0.03**	**0.02**	**0.00**
NMS-8	**-0.42**	**-0.02**	**-0.81**	**-0.21**	**-0.41**	**0.00**	**-0.19**	**-0.03**
Total	**-0.03**	**0.00**	**-0.01**	**-0.01**	**-0.07**	**0.01**	**0.00**	**-0.01**

1) Without Portugal.

Source: Own estimates and simulation, see text.

In the NMS-8, the unemployment rate is declining in the short-term for the less-skilled (-0.81 percentage points), compared to -0.41 percentage points for the medium skilled and -0.19 percentage points for the high-skilled. In the long-run, the unemployment-risk is declining by -0.21 percentage points for the less-skilled, while the effects for the medium- and high-skilled are rather negligible (Table 12).

5.4.3 The impact of migration from Bulgaria and Romania, 2004-2007

While we have analysed in the previous section the impact of migration flows which have been caused by the EU's Eastern enlargement during the period 2004 to 2007, we analyse here the impact of migration from the NMS-2 during the same period compared to a zero migration scenario. We cannot contrast the Eastern enlargement migration flows with a no EU enlargement counterfactual here, since the NMS-2 joined the EU not before 2007.

Table 13 displays the aggregate effects on GDP and factor income. The immigration from the NMS-2 of about 0.50 per cent of the labour force of the EU-15 increases the GDP of the EU-15 by 0.13 per cent in the short-run and 0.30 per cent in the long-run, while it reduces it in the NMS-2 by 2.91 per cent in the short-run and by 4.07 per cent in the long-run. The GDP per capita in the EU-15 falls by 0.19 per cent in the short-run and by 0.02 per cent in the long-run. The decrease in the short-run reflects the fact that the immigration from the NMS-2 reduces the capital stock per capita in the short-run, which is only partially compensated by higher labor market participation. Finally, the total factor income of the native population in the EU-15 is slightly reduced in the short-run, but it increases in the long-run. It is worth noting that the total factor income of natives in the main receiving countries, Spain and Italy, increase by 0.46 and 0.43 per cent, respectively, in the long-run (Table 13).

Table 13: The macroeconomic impact of migration from the NMS-2, 2004-2007

		GDP		GDP per capita		Factor income per native		Unemployment		Wages	
	Change of labour force	Short-run	Long-run	Short-run	Long-run	Short-run	Long-run	Short-run	Long-run	Short-run	Long-run
		Changes in per cent (unemployment rate: changes in percentage points)									
AT	0.13	0.09	0.10	-0.04	-0.03	0.03	0.04	0.01	0.01	-0.01	0.00
BE	0.22	0.09	0.15	-0.07	-0.01	0.00	0.06	0.07	0.05	-0.04	0.00
DE	0.04	0.02	0.04	-0.01	0.01	0.00	0.02	0.01	0.00	-0.01	0.00
DK	0.03	0.02	0.03	-0.01	0.01	0.00	0.01	0.01	0.01	-0.01	0.00
ES	2.29	0.42	1.33	-0.88	0.01	-0.44	0.46	0.65	0.24	-0.50	0.00
FI	0.01	0.00	0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FR	0.06	0.03	0.05	-0.03	-0.01	0.00	0.02	0.01	0.01	-0.01	0.00
GR	0.31	0.08	0.22	-0.13	0.01	-0.03	0.11	0.07	0.01	-0.08	0.00
IE	0.33	0.09	0.24	-0.08	0.06	-0.04	0.11	0.06	0.02	-0.11	0.00
IT	1.27	0.42	0.90	-0.39	0.08	-0.05	0.43	0.26	0.09	-0.32	0.00
LU	0.15	0.10	0.15	-0.03	0.02	0.04	0.08	0.01	0.00	-0.04	0.00
NL	0.04	0.03	0.04	-0.02	0.00	0.00	0.01	0.01	0.00	-0.01	0.00
SE	0.05	0.02	0.03	-0.02	-0.01	0.00	0.01	0.01	0.01	-0.01	0.00
UK	0.07	0.05	0.07	0.01	0.03	0.01	0.02	0.01	0.00	-0.01	0.00
BG	-1.93	-0.98	-1.98	0.97	-0.05	0.97	-0.05	-0.60	-0.08	0.50	0.00
RO	-4.70	-3.60	-4.83	1.15	-0.14	1.15	-0.14	-0.61	-0.16	0.84	0.00
EU-15[1)]	**0.50**	**0.13**	**0.30**	**-0.19**	**-0.02**	**-0.05**	**0.13**	**0.13**	**0.05**	**-0.10**	**0.00**
NMS-2	**-3.97**	**-2.91**	**-4.07**	**1.10**	**-0.12**	**1.10**	**-0.12**	**-0.57**	**-0.10**	**0.76**	**0.00**
Total	**0.18**	**0.11**	**0.28**	**0.11**	**0.28**	**0.25**	**0.41**	**0.08**	**0.04**	**-0.10**	**0.00**

1) Without Portugal.

Source: Own estimates and simulation, see text.

While the impact of immigration from the NMS-2 on unemployment in the EU-15 is almost neutral in the long-run, it increases by 0.13 percentage points in the short-run. According to our simulations, the unemployment rate would have increased by 0.65 percentage points in Spain and 0.26 percentage points in Italy in the short-run. However,

we observe a distinct decline of the unemployment rate in Spain during the period of observation. There may be several explanations for this puzzle: Capital stocks may have adjusted faster than projected, or the elasticity of the wage curve may be larger than according to our estimates.

Wages decline in our model in the receiving countries by about 0.10 per cent in the short-run. This is relatively moderate. In the two mainly affected receiving countries, Spain and Italy, wages decline by about 0.50 per cent (Spain) and 0.32 per cent (Italy) in the short-run. In the two sending countries, wages increase by 0.50 per cent (Bulgaria) and 0.84 per cent (Romania) in the short-run, while the long-run effects of emigration on wages are neutral (Table 13).

At the level of the EU-15, the short-run impact of immigration from the NMS-2 on the structure of wages is – at between -0.05 and -0.15 per cent for the different skill groups – rather moderate. However, we observe distinct differences in the main destination countries: The wages for the less skilled (-0.02 per cent) and the medium skilled (-0.93 per cent) decrease in Spain in the long-run, while those of the high skilled tend to rise (+0.46 per cent). In contrast, the effects on the structure of wages are rather neutral in Italy in the long-run. In the sending countries, the wages tend to increase for the high-skilled by 0.15 per cent in the long-run, while they decline for the medium and the less skilled moderately. In the short-run, we observe again the largest wage increase for high skilled workers (Table 14).

Table 14: The impact of migration from the NMS-2 on wages, 2004-2007

	All		Low-skilled		Medium-skilled		High-skilled	
	Short-run	Long-run	Short-run	Long-run	Short-run	Long-run	Short-run	Long-run
				Changes in per cent				
AT	-0.01	0.00	-0.01	0.00	-0.01	0.00	-0.01	0.00
BE	-0.04	0.00	-0.04	0.00	-0.03	0.01	-0.05	-0.01
DE	-0.01	0.00	-0.01	0.00	-0.01	0.00	-0.01	0.00
DK	-0.01	0.00	-0.01	0.00	-0.01	0.00	-0.01	0.00
ES	-0.50	0.00	-0.48	-0.02	-1.42	-0.93	-0.09	0.46
FI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FR	-0.01	0.00	-0.01	0.00	-0.01	0.00	-0.01	0.00
GR	-0.08	0.00	-0.11	-0.02	-0.09	-0.01	-0.05	0.04
IE	-0.11	0.00	-0.11	0.00	-0.12	-0.01	-0.11	0.01
IT	-0.32	0.00	-0.31	0.00	-0.33	-0.01	-0.30	0.02
LU	-0.04	0.00	-0.02	0.02	-0.05	-0.01	-0.05	-0.01
NL	-0.01	0.00	-0.01	0.00	-0.01	0.00	-0.01	0.00
SE	-0.01	0.00	-0.01	0.00	-0.01	0.00	0.00	0.00
UK	-0.01	0.00	-0.01	0.00	-0.01	0.00	-0.01	0.00
BG	0.50	0.00	0.49	0.02	0.46	-0.05	0.56	0.05
RO	0.84	0.00	0.80	-0.04	0.77	-0.06	1.06	0.21
EU-15[1)]	**-0.10**	**0.00**	**-0.15**	**0.00**	**-0.12**	**-0.04**	**-0.05**	**0.05**
NMS-2	**0.76**	**0.00**	**0.76**	**-0.03**	**0.71**	**-0.06**	**0.88**	**0.15**
Total	**-0.10**	**0.00**	**-0.14**	**0.00**	**-0.11**	**-0.04**	**-0.05**	**0.05**

1) Without Portugal.

Source: Own estimates and simulation, see text.

The unemployment rate in the receiving countries increases for the less skilled by 0.20 percentage points, for the medium skilled by 0.14 percentage points in the short-run and only slightly by 0.03 percentage points for the high-skilled. In the long-run, the unemployment rate is declining for the high-skilled, but slightly increasing for the low- and medium-skilled. Particularly affected are again medium skilled workers in Spain. In the sending countries, we observe that less-skilled and high-skilled workers benefit particularly from falling unemployment rates in the long-run, while the medium skilled benefit less than proportional (Table 15).

Table 15: The impact of migration from the NMS-2 on unemployment, 2004-2007

	All		Low-skilled		Medium-skilled		High-skilled	
	Short-run	Long-run	Short-run	Long-run	Short-run	Long-run	Short-run	Long-run
	Changes in percentage points							
AT	0.01	0.01	0.02	0.01	0.00	0.00	0.04	0.04
BE	0.07	0.05	0.15	0.11	0.03	0.01	0.05	0.03
DE	0.01	0.00	0.02	0.00	0.01	0.00	0.01	0.01
DK	0.01	0.01	0.00	0.00	0.00	0.00	0.02	0.02
ES	0.65	0.24	0.64	0.20	1.40	0.99	0.06	-0.28
FI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FR	0.01	0.01	0.01	0.00	0.02	0.02	0.01	0.01
GR	0.07	0.01	0.07	0.02	0.07	0.00	0.03	-0.01
IE	0.06	0.02	0.08	0.03	0.06	0.02	0.03	0.01
IT	0.26	0.09	0.26	0.06	0.30	0.15	0.14	0.01
LU	0.01	0.00	0.01	-0.01	0.02	0.01	0.02	0.01
NL	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.01
SE	0.01	0.01	0.03	0.02	0.01	0.01	0.00	0.00
UK	0.01	0.00	0.01	0.00	0.01	0.01	0.00	0.00
BG	-0.60	-0.08	-1.12	-0.23	-0.49	0.00	-0.38	-0.11
RO	-0.61	-0.16	-0.62	-0.26	-0.66	-0.12	-0.54	-0.31
EU-15[1)]	**0.13**	**0.05**	**0.20**	**0.06**	**0.14**	**0.09**	**0.03**	**-0.03**
NMS-2	**-0.57**	**-0.10**	**-0.66**	**-0.20**	**-0.59**	**-0.07**	**-0.41**	**-0.15**
Total	**0.08**	**0.04**	**0.15**	**0.05**	**0.07**	**0.07**	**0.01**	**-0.04**

1) Without Portugal.

Source: Own estimates and simulation, see text.

5.4.4 The impact of transitional arrangements and the free movement of workers from the NMS-8, 2008–2011

In this section we address the impact of a prolongation of the transitional arrangements for the free movement of workers from the NMS-8 as well as the implications of introducing the free movement for them. We evaluate the impacts during the 2008-2011 period, i.e. until the date the transitional arrangements will finally expire. Note that introducing the free movement would trigger not only an increase of aggregate migration but also a reversal in the geographical distribution of the migration flows.

Table 16 displays the macroeconomic effects of the prolongation of the transitional arrangements and the introduction of the free movement. The difference between these scenarios is interpreted as the effect of introducing the free movement in all remaining

countries in 2009. As a consequence of the redirection of migration flows away from the UK and Ireland we find that the GDP declines by 0.11 per cent in the UK and by 0.17 per cent in Ireland, while the GDP increases in Germany by 0.11 per cent and by 0.24 per cent in Austria in the free movement case compared to a prolongation of the transitional arrangements. However, since both countries have to open their labour markets anyway in 2011, the effects are modest. The unemployment rate rises by 0.08 percentage points in Germany and 0.02 percentage points in Austria, while wages tend to decline (-0.08 per cent in Germany and -0.02 per cent in Austria).[5]

Table 16: Short-run effects of transitional arrangements and the free movement of workers from the NMS-8, 2008-2011

	Change of labour force	GDP	GDP per capita	Factor income per native	Unemployment	Wages
	Changes in per cent (unemployment rate: changes in percentage points)					
AT	0.33	0.24	-0.01	0.09	0.02	-0.02
BE	-0.02	-0.01	0.01	0.00	-0.01	0.00
DE	0.28	0.11	-0.09	-0.02	0.08	-0.08
DK	0.01	0.01	0.00	0.00	0.00	0.00
ES	0.00	0.00	0.00	0.00	0.00	0.00
FI	0.11	0.03	-0.08	-0.02	0.03	-0.03
FR	0.03	0.02	-0.01	0.00	0.01	0.00
GR	0.07	0.02	-0.05	-0.01	0.02	-0.02
IE	-1.26	-0.17	0.57	0.24	-0.23	0.44
IT	0.02	0.01	-0.01	0.00	0.00	-0.01
LU	-0.18	-0.15	-0.04	-0.06	-0.02	0.05
NL	-0.01	-0.01	0.00	0.00	0.00	0.00
SE	0.05	0.03	0.00	0.01	0.01	-0.01
UK	-0.30	-0.11	0.08	0.02	-0.05	0.07
CZ	-0.30	-0.27	0.02	0.02	-0.06	0.08
EE	-0.32	-0.15	0.18	0.18	-0.07	0.09
HU	-0.33	-0.25	0.08	0.08	-0.03	0.08
LT	-0.12	-0.06	0.07	0.07	-0.03	0.03
LV	-0.13	-0.08	0.05	0.05	-0.03	0.04
PL	-0.01	-0.01	0.01	0.01	-0.01	0.00
SI	-0.54	-0.31	0.23	0.23	-0.05	0.09
SK	0.10	0.04	-0.06	-0.06	0.04	-0.03
EU-15[1)]	**0.02**	**0.02**	**-0.01**	**0.00**	**0.01**	**0.00**
NMS-8	**-0.12**	**-0.12**	**0.00**	**0.00**	**-0.01**	**0.04**
Total	**0.00**	**0.01**	**0.01**	**0.02**	**0.01**	**0.00**

1) Without Portugal.

Source: Own estimates and simulation, see text.

[5] For the effects on the structure on wages and unemployment see Table A1 in Appendix A.

5.4.5 The impact of transitional arrangements and the free movement of workers from Bulgaria and Romania, 2008-2014

The selective application of immigration restrictions vis-à-vis workers from Bulgaria and Romania by the EU-15 countries has affected – similar to the NMS-8 – both the overall scale and the geographical distribution of migration flows from the NMS-2. Particularly Spain and Italy experienced an immigration surge, while inflows to Germany and Austria declined. Introducing the free movement of workers for Bulgaria and Romania will therefore again both increase the number of immigrants and change the geographical distribution of immigration flows. The regional structure will change to a smaller extent compared to the NMS-8.

Our macroeconomic simulations reflect this picture. In Germany, the GDP will increase if the free movement is introduced, while the GDP per capita falls, wages tend to decline, and the unemployment rate tends to rise in the short-run (Table 17). This is offset in the long-run due to the adjustment of capital stocks. Then GDP increases further, while the wage and unemployment effects diminish. The same picture can be drawn for Italy: GDP increases there by 0.06 per cent, wages shrink by 0.04 per cent, and the unemployment rises there by 0.03 percentage points as a consequence of further immigration. For Spain we obtain a slightly different picture: The scale of migration under the transitional arrangements and under the free movement is almost the same in the EU-15; however, the share of Spain in the overall inflows will decline if free movement is introduced according to our scenarios.

Table 17: Short-run effects of transitional arrangements and the free movement of workers from Bulgaria and Romania, 2008-2014

	Change of labour force	GDP	GDP per capita	Factor income per native	Unemployment	Wages
	Changes in per cent (unemployment rate: changes in percentage points)					
AT	0.41	0.28	-0.12	0.11	0.03	-0.02
BE	-0.08	-0.03	0.02	0.00	-0.02	0.01
DE	0.22	0.09	-0.06	-0.01	0.06	-0.06
DK	0.03	0.02	0.00	0.00	0.01	-0.01
ES	-0.59	-0.12	0.21	0.10	-0.16	0.12
FI	0.01	0.01	-0.01	0.00	0.00	0.00
FR	-0.04	-0.02	0.02	0.00	-0.01	0.00
GR	0.35	0.08	-0.15	-0.03	0.07	-0.09
IE	0.79	0.25	-0.16	-0.06	0.12	-0.24
IT	0.17	0.06	-0.05	0.00	0.03	-0.04
LU	0.04	0.03	-0.01	0.01	0.00	-0.01
NL	0.00	0.00	0.00	0.00	0.00	0.00
SE	0.02	0.01	-0.01	0.00	0.01	0.00
UK	0.02	0.01	0.00	0.00	0.00	0.00
BG	-0.68	-0.36	0.33	0.33	-0.21	0.17
RO	-0.24	-0.19	0.05	0.05	-0.03	0.04
EU-15[1)]	**0.03**	**0.03**	**0.00**	**0.01**	**0.00**	**-0.01**
NMS-2	**-0.36**	**-0.24**	**0.13**	**0.13**	**-0.08**	**0.07**
Total	**0.01**	**0.03**	**0.03**	**0.03**	**-0.01**	**-0.01**

1) Without Portugal.

Source: Own estimates and simulation, see text.

Altogether, the enlarged EU is a winner of the free movement of workers within the EU. The joint GDP rises by 0.03 per cent and income of natives rises by 0.03 per cent relative to a scenario where the present immigration restrictions under the transitional arrangements are prolonged during the 2008–2014 period.[6]

5.5 Conclusions

In this section we applied a general equilibrium framework for the analysis of the impact of migration in the enlarged EU on wages, employment, and some macroeconomic aggregates. We modelled wage rigidities in form of a wage curve, assuming that wages respond imperfectly to an increase in the unemployment rate. We find an average elasticity of the wage curve of -0.13, which is slightly higher than that found by the average of regional level studies. In our view, the higher elasticity reflects the impact of centralised wage setting, resulting in a higher elasticity of the wage curve if it is measured at the national level. Another important figure driving the results of our study is the finding that capital stocks adjust to an increasing labour supply, although these adjustments may take time. The speed of adjustment has been estimated and is considered in our simulations.

The simulation of the impact of migration from the NMS-8 and the NMS-2 provides a number of interesting insights. First, we observe that the additional migration from the NMS-8 caused by the EU's Eastern enlargement during the 2004-2007 period has increased the aggregate GDP of the enlarged EU by about 0.11 per cent in the short-run and 0.20 per cent in the long-run, while the migration from the NMS-2 has increased the GDP of the enlarged EU by 0.11 in the short-run and by 0.28 per cent in the long-run during the same period of time. Second, we observe that the total factor income of natives in the receiving countries tends to increase in the long-run, while it declines only slightly in the short-run. This can be traced back to the fact that complementary factor incomes tend to increase in case of migration. Third, we find that the unemployment is slightly increasing in the receiving countries in the short-run, while it is falling in the sending countries. The long-run effects of migration on the aggregate unemployment rate are by and large neutral. Fourth, wages decline slightly in the receiving countries and increase in the sending countries in the short-run, while the long-run impact of migration on wages is neutral. Fifth, we find that low- and medium skilled workers are slightly more affected by declining wages in the EU-15 compared to high-skilled workers in the short-term. This pattern reflects that migrants from the NMS are heavily concentrated at the low and medium ranges of the skill spectrum if we adjust for their employment structure.

An important caveat is crucial to highlight here. In Ireland and Spain, which are the countries mainly affected by immigration from the NMS-8 and the NMS-2, respectively, our simulations yield relatively large effects particular with respect to unemployment and wages. However, the labour supply shocks in both countries have not resulted in visible changes of the unemployment rates there. It is thus likely that we tend to overstate the

[6] For the effects on the structure on wages and unemployment see Table A2 in Appendix A.

migration effects on these countries. There might be three explanations for this puzzle: First, capital stocks may adjust faster than predicted by our estimates. Second, the wage response might be larger than is expected by our estimates of the wage curve. As an example, Bentolila et al. (2007) argue that immigration itself has changed the bargaining position of workers, such that responsiveness of wages has increased through higher immigration. Thus, wages may decline even further, while the unemployment effects are smaller compared to our simulations. Third, there may be other adjustment mechanisms which are not considered by our model but mitigate the effects of migration on wages and unemployment such as sectoral change and international trade. The latter aspect is addressed by the model presented in the next section.

6 The macroeconomic consequences of labour mobility: The impact of migration, trade and capital mobility in a multisectoral CGE model

In this section we examine the effects of labour mobility in the context of EU Eastern enlargement on two destination economies, the UK and Germany and the sending economies Poland, Hungary, Slovakia, and Slovenia. The study is based on a computable general equilibrium (CGE) model comprising 16 commodities, 16 domestic industries and reflecting trade of intermediary and final goods as well as the movement of capital.

CGE models have been widely applied for the analysis of the impact of the EU integration process. Integration in this sense is typically modelled as a reduction in transaction costs, especially the cost of trade, of capital movement, and of migration between countries. The strength of this kind of numerical CGE models lies in the illustration of the complex interactions underlying these processes. With this CGE model we are therefore able to examine interactions between trade, capital movements and migration and to analyse the impact of migration at the sectoral level.

The analysis in this section proceeds in four steps. In Section 6.1 we briefly outline the underlying theoretical model. Section 6.2 describes the calibration of the model and the data used. In Section 6.3 we present the simulation results for the different policy scenarios and the counterfactual scenario. This allows us to consider the impact of migration in the specific context under the transitional arrangements (2004-2007) and based on our migration projections the effects of free movement (2008-2011 for the NMS-8 and 2008-2014 for the NMS-2). We describe the scenarios first and present then the results country by country. In Section 6.4 we summarise the sectoral results and discuss their impact on the economy again country by country. Section 6.5 concludes.

6.1 Outline of the model

The CGE model employed here can be classified as a standard comparative static model based on the IFPRI[7] framework. The IFPRI type models follow the neoclassic-structuralist modelling tradition first presented in Dervis et al. (1982). The equations of the model are derived from microeconomic assumptions about the behaviour of price taking agents.

[7] IFPRI (2002) provide a standard CGE model, easy to enhance. Most modern CGE models are based on this framework, due to the excellent report procedures included in the model code.

Consumers maximize utility subject to their budget constraints. Producers choose inputs so as to minimize production costs. Production technologies are characterised by a CES or Leontief function whereby resources are limited and distributed by market forces.

The model consists of n = 16 commodities, m = 16 domestic industries, and h = 2 types of households, migrants and natives. In total there are 2 agricultural industries, 4 manufacturing industries and 10 service industries. Each commodity corresponds to an industry. The consideration of two types of households allows considering the different consumption behaviour of natives and migrants. The empirical basis of the model is formed by the current input-output matrices from Eurostat which enable us to consider the recent developments in the interconnection between trade, factor movements and production.

In order to capture the effects of the European integration process, we enhanced the two country framework of the IFPRI model to a three country framework which reflects one country and two regions, the EU and the rest of the world (see Baas and Brücker, 2008). The economies of Germany and the UK are linked to the EU and to the rest of the world via trade in goods and services, capital flows and the migration of labour. Transaction costs within the EU are lower; therefore we consider the different trade pattern emerging from EU integration and distinguish between Intra- and Extra-EU trade.

Governmental consumption is restricted to tax income and borrowing, which has implications for other economic agents.

An important feature of the model is the reflection of labour market imperfections by a wage curve which is novel in the CGE literature on the effects of EU Eastern enlargement (compare Baas and Brücker, 2008). The consideration of labour market rigidities through the specification of a wage curve postulates a negative relationship between the real wage rate and the unemployment rate (Blanchflower and Oswald, 1994, see also the first section of this deliverable). Hence, migration leads to lower wages and higher unemployment in the destination country, while unemployment is reduced and wages rise in the sending country. Nevertheless, we model a short-run scenario reflecting imperfect adjustment of the capital-output ratio, which should fully adjust in the long-run. The adjustment parameters in the model are therefore estimated.

The technical features of the model are described in detail in Appendix B.

6.2 Data and calibration of the model

The numerical specification of the CGE model is undertaken by using the Eurostat supply and demand matrices. The matrices are compiled according to the European Systems of Accounts ESA 95 which provide common classifications and a harmonised methodology along the convention in harmonising national gross domestic products within the European Union. The transmission of input-output tables is compulsory since the end of 2002. This concerns annual supply and demand matrices and five-yearly symmetric input-output-matrices. Nevertheless, data quality and the transmission of matrices differ along member states. Some supply and demand matrices are not symmetric while other

matrices suffer missing or hidden values. The application of CGE-modelling on base of these matrices is therefore restricted.

The supply and demand matrices provide detailed information on the economic system. The demand table provides inter alia information on intermediate consumption, the application of factors of production, taxation and subsidies at the activity level and consumption of households, the government, and external trade. The supply matrices show inter alia the production of marketed output, the import of goods and services, and sales taxes. The demand and supply matrix is combined to a symmetric input-output matrix with industries and activities. Since the classification of goods relies on CPA[8] systematic, goods and activities use the same nomenclature which facilitates the calibration of the model.

Beside the data obtained from Eurostat matrices, additional data is needed to reflect inter alia the level of labour market restrictions, the welfare system, and trade issues. Hence, a social accounting matrix (SAM) is compiled as an extended symmetric input-output table. Whenever possible we used Eurostat data to build the SAM matrix of a country.

After the specification of the SAM, the theoretical model parameters are calibrated to real values. Thus, in a first step, the model is solved using the SAM variables as variables of the model. This provides us with information about the parameters of the model. In a second step the model is solved using the calibrated parameters. The solution of the second run is compared with the SAM data. If the model matches this data, the base year model is calibrated and can be used for simulation. In Appendix B we provide the key equations of the theoretical model, while Appendix C presents a figure of a typical SAM.

6.3 Simulation results

The following six subsections present the country-specific macroeconomic effects of the EU Eastern enlargement on Germany, Hungary, Poland, the UK, Slovakia, and Slovenia. The simulations presented here consider the impact of migration on GDP, the government, trade, capital movements, and the structure of the economy by sectors. As outlined in the introduction, the effects of migration are captured by two policy scenarios: The first scenario describes the effects of Eastern enlargement under the transitional arrangements whereas the second scenario describes a situation of free movement beginning in 2009. The first scenario covers a time period from 2004 to 2007, the second a period from 2008 to 2011 (2008-2014 for the NMS-2 countries).

The selection of countries which are considered here is particularly relevant. The UK is the country which has been in absolute terms mainly affected by migration in the aftermath of enlargement, since it has almost completely removed the barriers for worker mobility vis-à-vis the new member states. In contrast, Germany still heavily restricts migration from the NMS, but has been in absolute terms the main destination for migration from there before enlargement. The four sending countries differ with respect to their size and the amount of migrants working abroad. Therefore these countries are

[8] Statistical Classification of Products by Activity in the European Economic Community.

affected by the EU Eastern enlargement very differently. According to our estimates, about 1.3 million migrants from Poland will reside in the EU-15 by 2007 in the Eastern enlargement scenario, while only 630,000 Polish migrants would live there in the case without enlargement. The difference accounts for almost two per cent of the Polish workforce. While Slovakia experiences a similar effect of EU enlargement, the neighbouring country Slovenia is much less affected by emigration, as well as the medium sized Hungary.

The results in Table 18 reflect these differences in migration after enlargement. In general, the sending countries experience a reduction in GDP and unemployment while wages increase. Per capita GDP is therefore higher after the enlargement. Otherwise, the receiving countries' GDP and unemployment rates are higher and wages are lower with EU-enlargement, but GDP per capita declines.

In the second policy scenario we see a partial reversion of the effects of migration diversion after EU Enlargement. On the one hand the main destination country after 2004, the UK, gains fewer migrants with free movement. Therefore the GDP declines, wages rise and unemployment is reduced. On the other hand, Germany experiences a rise in migration with free movement. That's why the GDP increases, while wages decline and unemployment rises. Germany regains the role as a mayor destination country for NMS-8 migrants in this scenario. However, since there are only two years left of the possibility to apply transitional periods, effects are small.

Table 18: Simulation Results, Key Macroeconomic Figures, NMS-8

	Germany		UK		Hungary		Poland		Slovenia		Slovakia	
	Enlargement effects	Free movement effect	Enlargement effects	Free movement effect	Enlargement effects	Free movement effect	Enlargement effects	Free movement effect	Enlargement effects	Free movement effect	Enlargement effects	Free movement effect
	2004-2007	2008-2011	2004-2007	2008-2011	2004-2007	2008-2011	2004-2007	2008-2011	2004-2007	2008-2011	2004-2007	2008-2011
	changes in percent											
GDP	0.06	0.17	0.86	-0.20	-0.23	-0.19	-0.92	-0.01	0.17	-0.38	-0.44	0.03
GDP per capita	-0.02	-0.06	-0.03	0.01	0.18	0.15	0.81	0.02	-0.06	0.16	0.81	-0.08
Exports intra EU	0.12	0.33	1.24	-0.29	-0.21	-0.17	-1.25	-0.01	0.20	-0.45	-0.26	0.01
Exports extra EU	0.12	0.32	1.09	-0.26	-0.21	-0.17	-1.24	-0.01	0.20	-0.45	-0.27	0.01
Imports intra EU	0.05	0.12	0.81	-0.19	-0.25	-0.20	-0.80	0.00	0.16	-0.35	-0.54	0.04
Imports extra EU	0.05	0.13	0.89	-0.21	-0.24	-0.20	-0.81	0.00	0.16	-0.36	-0.54	0.04
Wages	-0.02	-0.06	-0.34	0.08	0.12	0.10	0.32	0.01	-0.05	0.13	0.34	-0.03
	changes in percentage points											
Unemployment rate	0.02	0.06	0.13	-0.03	-0.08	-0.07	-0.48	-0.01	0.03	-0.07	-0.45	0.04

Notes: The simulation results indicate the difference between the status-quo scenario and the counterfactual scenario of no enlargement.

Sources: Own estimates.

In both scenarios our results predict moderate effects of migration on wages and unemployment. The migration effect is mitigated in case of a partial adjustment of the capital stock and a redistribution of factors among sectors. Therefore, we observe an increase in labour but also an increase in capital in the destination countries. In the sending countries, capital is correspondingly reduced. The sectoral factor mobility assures, as a second effect, that the new factor endowments are distributed to their most productive use.

Migration also affects trade patterns. In all countries except Poland, migration improves the trade balance. In Germany, we observe only a small migration effect of 0.05 per cent on imports, but a strong 0.12 per cent increase in exports (see Table 18). Interestingly, in most countries trade with EU countries (Intra-EU trade) and trade with third countries (Extra-EU trade) reacts similar. Only in the UK, Intra-EU trade reacts more strongly than Extra-EU trade.

In the reminder of this section we take a closer look at country specific effects. These effects are driven by the production structure of the economy, the openness of the economy and the migration shock.

6.3.1 Germany

The migration structure in the aftermath of EU Eastern enlargement changes migration patterns heavily. Germany as the former main receiving country is therefore no longer the main destination of migrants after the enlargement. Indeed, we estimate an increase in migration by 62,000 compared to pre-enlargement figures. This is only a moderate increase which shows the strict application of transitional agreements. Hence, macroeconomic effects in Germany are small. This migration pattern is reversed if we assume free movement from 2009 on.

If we assume that migrants are employed as their already migrated counterparts, the labour supply shock increases the labour force in the enlargement scenario by 42,000. This figure considers an employment rate of NMS-migrants in Germany of 64 per cent, which is only slightly higher than the corresponding employment rate of natives.

As the simulation results show, migration from the NMS-8 countries has only a small impact on the German economy (see Table 19). In the enlargement scenario, the increase in GDP is small at 0.06 per cent, while the free movement scenario adds another 0.17 per cent. The impact of migration from Bulgaria and Romania (NMS-2), is almost neglible. The GDP rises by 0.01 per cent in the enlargement scenario. However, in the free movement scenario we observe a 0.14 per cent increase in GDP after all.

As discussed in Chapter 5, we use a wage curve for modelling the labour market. Hence, a labour supply shock leads by assumption to lower wages and higher unemployment. In the enlargement scenario, wages are shrinking by about 0.02 per cent. Therefore, as expected, EU enlargement has not affected the key macroeconomic variables of Germany very much. This is due to the small labour supply shock.

If Germany abstains from applying the transitional arrangements in 2009, migration enhances the labour force in the free movement scenario by an additional 0.28 per cent and increases the GDP by 0.17 per cent (see Table 19). The additional migration leads to a rise in the unemployment rate of 0.06 percentage points and a reduction of wages by about -0.06 per cent. However, effects on GDP per capita are modest at -0.06 per cent since the labour market participation rate of migrants is higher than that of natives.

Table 19: Simulation results Germany, key macroeconomic figures

		Enlargement effect		Free movement effect	
		NMS-8	NMS-2	NMS-8	NMS-2
	Base year	2004-2007	2004-2007	2008-2011	2008-2014
			Changes in per cent		
GDP	2211200	0.06	0.01	0.17	0.14
GDP per capita	26791	-0.02	0.00	-0.06	-0.04
Private consumption	1239350	0.03	0.00	0.08	0.08
Investment	377050	0.04	0.01	0.10	0.09
Government consumption	453240	0.04	0.01	0.11	0.10
Taxes	231490	0.06	0.01	0.15	0.13
Exports intra EU	514790	0.12	0.02	0.33	0.26
Exports extra EU	311461	0.12	0.02	0.32	0.25
Imports intra EU	-405720	0.05	0.01	0.12	0.11
Imports extra EU	-278971	0.05	0.01	0.13	0.12
Wages	29	-0.02	0.00	-0.06	-0.04
Capital	841910	0.02	0.00	0.05	0.06
Labour force	42551	0.10	0.02	0.28	0.22
			Changes in percentage points		
Unemployment rate	9	0.02	0.00	0.06	0.04

Source: Own estimates and simulation, see text.

As we see in Table 20, migration influences the sectoral structure and the trade pattern of the economy. However, sectoral adjustments are small. Only the manufacturing sector producing tradable goods is affected by the labour supply shock in the free movement scenario above the average production increase (an increase of 0.3 per cent in case of free movement), while all other sectors enhance their production only slightly (0.2 per cent in total with free movement).

Table 20: Simulation results Germany, sectoral impact

		Enlargement effect		Free movement effect	
	Base Year	NMS-8	NMS-2	NMS-8	NMS-2
		Changes in per cent			
Agriculture, hunting and forestry	47730	0.10	0.00	0.10	0.10
Fishing	420	0.00	0.00	0.10	0.10
Mining and quarrying	12590	0.00	0.00	0.20	0.20
Manufacturing	1357440	0.10	0.00	0.30	0.20
Electricity, gas and water supply	91220	0.00	0.00	0.10	0.10
Construction	189440	0.10	0.00	0.10	0.10
Wholesale and retail trade [1)]	343810	0.00	0.00	0.20	0.20
Hotels and restaurants	62070	0.10	0.00	0.10	0.10
Transport, storage and communication	261690	0.00	0.00	0.10	0.10
Financial intermediation	221390	0.10	0.00	0.10	0.10
Real estate, renting and business activities	676450	0.10	0.00	0.10	0.10
Public administration and defence; compulsory social security	175940	0.10	0.00	0.10	0.10
Education	114210	0.10	0.00	0.10	0.10
Health and social work	204850	0.10	0.00	0.10	0.10
Other community, social and personal service activities	153330	0.10	0.00	0.10	0.10
Activities of households	6620	0.10	0.00	0.10	0.10
Total	**3919200**	**0.00**	**0.00**	**0.20**	**0.20**

1) Includes also the repair of motor vehicles, motorcycles, and personal and household goods.

Source: Own estimates and simulation, see text.

6.3.2 UK

In the aftermath of EU-enlargement the UK opted for the free movement of workers from NMS-countries. The only obligation for migrants is to register, yet access to welfare is restricted. Migration therefore increases heavily by 455,000, while the labour force increases by 340,000. This strong increase in the labour force is initially driven by the migration shock itself, but also from the high employment rate of migrants of 75 per

cent. Interestingly, the employment rate of NMS-2 migrants is even higher with 84 per cent. Both figures are even larger than the employment rate of natives and essentially larger than the employment rate of NMS-migrants in Germany. Accordingly, the macroeconomic effects of migration are strong.

In Table 21 we see the development of key macroeconomic figures in the enlargement and free movement scenario. As we can see, macroeconomic effects are driven by the large immigration from NMS-8 countries. Therefore the GDP in the enlargement scenario increases by 0.86 per cent. The GDP per capita shrinks with 0.03 per cent only modestly. The high participation rate of NMS-8 workers compensates to some extend their low capital endowment.

The impact of migration on trade is similar to Germany. Migration enhances exports and imports, but the effect on exports is stronger. However, for the UK the difference between imports (0.81 Intra EU / 0.89 Extra EU) and exports (1.24 Intra EU / 1.09 Extra EU) are relatively smaller and more differentiated among destinations than in Germany. Therefore, the trade balance with the rest of the world improves only modestly, while the trade balance with other EU countries improves strongly.

In all models, a wage curve drives the labour market effects. Given the size of the shock, we find a relatively small rise in unemployment (0.13 percentage points, EU-enlargement) and a small reduction in wages (0.34 per cent, EU-enlargement).

In the free movement scenario, we predict a decrease in migration. The labour force is reduced by 0.3 per cent compared to a situation where some EU-countries like Germany and Austria stay closed. This leads to a partial reversion of the effects of migration observed with transitional periods. The GDP is shrinking and the rise in GDP per capita is almost negligible, while exports and imports are lower. We also see that the improvement of the trade balance is partly reversed, if all countries adapt free movement. Consequently, wages rise by 0.08 per cent, while unemployment is reduced by 0.03 percentage points.

Table 21: Simulation results UK, key macroeconomic figures

		Enlargement effect		Free movement effect	
		NMS-8	NMS-2	NMS-8	NMS-2
	Base year	2004-2007	2004-2007	2008-2011	2008-2014
			Changes in per cent		
GDP	1147947	0.86	0.02	-0.20	0.02
GDP per capita	19313	-0.03	0.00	0.01	0.00
Private consumption	727827	0.76	0.02	-0.18	0.01
Investment	179922	0.73	0.02	-0.17	0.01
Government consumption	259197	0.90	0.02	-0.21	0.02
Taxes	140934	0.85	0.02	-0.20	0.02
Exports intra EU	142337	1.24	0.02	-0.29	0.02
Exports extra EU	126816	1.09	0.02	-0.26	0.02
Imports intra EU	-162886	0.81	0.02	-0.19	0.01
Imports extra EU	-125266	0.89	0.02	-0.21	0.02
Wages	22	-0.34	-0.01	0.08	0.00
Capital	391375	0.34	0.01	-0.08	0.01
Labour force	29652	1.28	0.02	-0.30	0.02
			Changes in percentage points		
Unemployment rate	5	0.13	0.00	-0.03	0.00

Source: Own estimates and simulation, see text.

If we look at the results for production, we see an overall increase. However, some sectors like Manufacturing, Education and Health, and Social Work enhance their production above average. This can be traced back to two facts: On the one hand there is a direct increase in labour supply in these sectors by migrants; on the other hand, native workers shift sectors if they can be more productive there. This second indirect effect can outpace the direct migration effect as is the case in the manufacturing sector. Altogether, production is rising strongly in the enlargement scenario by 0.8 per cent, due to a sharp rise in the labour force. In the free movement scenario, where no country opts for transitional periods, we see an overall lower production of 0.2 per cent. The sectors which gained most from direct or indirect migration effects lose more, that's why we see a slight reversion of the migration-driven sectoral distribution of additional production.

Table 22: Simulation results UK, sectoral impact

		Enlargement effect		Free movement effect	
	Base Year	NMS-8	NMS-2	NMS-8	NMS-2
			Changes in per cent		
Agriculture, hunting and forestry	21935	0.70	0.00	-0.20	0.10
Fishing	1801	0.50	0.00	-0.10	0.10
Mining and quarrying	32508	0.40	0.00	-0.10	0.10
Manufacturing	401402	1.10	0.00	-0.30	0.10
Electricity, gas and water supply	49691	0.70	0.10	-0.10	0.10
Construction	158998	0.70	0.00	-0.10	0.10
Wholesale and retail trade [1)]	233390	0.90	0.00	-0.30	0.10
Hotels and restaurants	65163	0.80	0.10	-0.20	0.10
Transport, storage and communication	168203	0.80	0.00	-0.20	0.10
Financial intermediation	153374	0.60	0.10	-0.20	0.10
Real estate, renting and business activities	362583	0.60	0.00	-0.20	0.10
Public administration and defence; compulsory social security	107425	0.90	0.00	-0.20	0.10
Education	82117	0.90	0.10	-0.20	0.10
Health and social work	130207	0.90	0.10	-0.20	0.10
Other community, social and personal service activities	94650	0.70	0.10	-0.20	0.10
Activities of households	4957	0.90	0.00	-0.30	0.10
Total	**2068403**	**0.80**	**0.10**	**-0.20**	**0.10**

1) Includes also the repair of motor vehicles, motorcycles, and personal and household goods.

Source: Own estimates and simulation, see text.

6.3.3 Hungary

In the aftermath of EU-enlargement Hungary reports an unemployment rate at about 6 per cent. The compensation of employees in Hungary was only 36.5 per cent of EU-25 average, but above the NMS-8 figure of 29.7 per cent. Migration therefore affected the Hungarian economy below the average of NMS-8 countries. We estimate a migration

effect of EU-enlargement of 44.000 emigrants which is 0.41 per cent of the Hungarian labour force.

Table 23: Simulation results Hungary, key macroeconomic figures

		Enlargement effect	Free movement effect
	Base year	2004-2007	2008-2011
		Changes in per cent	
GDP	18575041	-0.23	-0.19
GDP per capita	1831431	0.18	0.15
Private consumption	10354737	-0.25	-0.20
Investment	4533796	-0.24	-0.20
Government consumption	4812376	-0.28	-0.23
Taxes	2636108	-0.24	-0.20
Exports intra EU	7918169	-0.21	-0.17
Exports extra EU	2923220	-0.21	-0.17
Imports intra EU	-6686784	-0.25	-0.20
Imports extra EU	-5280472	-0.24	-0.20
Wages	2195	0.12	0.10
Capital	7403523	-0.15	-0.12
Labour force	4265	-0.41	-0.34
		Changes in percentage points	
Unemployment rate	9	-0.08	-0.07

Source: Own estimates and simulation, see text.

The reduction in the labour force is reducing production and therefore GDP. Nevertheless, since the population declines, per capita GDP is rising. In Table 23 the GDP is reduced at about 0.23 per cent in the EU enlargement scenario.

The assumption of a partial adjustment of the capital stock leads to a decline in capital endowment; consequently investment is reduced in the simulation model by 0.24 per cent. Nevertheless, the trade balance is slightly improving. Exports and Imports are moving closely among the same rate as GDP is shrinking, but the decline of exports is weaker (0.21 per cent) than the decline of imports (0.25 per cent).

If the application of transitional periods would be dropped in 2009 by the remaining countries, migration from Hungary would increase. This would strengthen the effects already seen in the enlargement scenario. The GDP is declining, while GDP per capita is improving (0.15 per cent). The trade balance is again slightly improving, while exports decline less (0.17 per cent) than imports (0.20 per cent). In both scenarios Intra-EU and Extra-EU imports and export react roughly similar.

As we see in Table 24, the reduced labour force does not lead to a strong redistribution of production among sectors. Production is shrinking in the enlargement and the free trade scenario by 0.2 per cent and almost all sectors are reducing their production at this amount. Hence, there is no big difference between tradable goods and non-tradable goods.

Table 24: Simulation results Hungary, sectoral impact

		Enlargement effect	Free movement effect
	Base year	2004-2007	2008-2011
		Changes in per cent	
Agriculture, hunting and forestry	1650517	-0.20	-0.20
Fishing	23954	-0.30	-0.20
Mining and quarrying	106092	-0.30	-0.20
Manufacturing	14914072	-0.20	-0.20
Electricity, gas and water supply	1394533	-0.20	-0.10
Construction	2057310	-0.20	-0.10
Wholesale and retail trade [1)]	3752648	-0.20	-0.20
Hotels and restaurants	688831	-0.30	-0.20
Transport, storage and communication	2364454	-0.30	-0.20
Financial intermediation	1155924	-0.20	-0.20
Real estate, renting and business activities	4593807	-0.20	-0.20
Public administration and defence; compulsory social security	2050603	-0.30	-0.20
Education	1238609	-0.30	-0.20
Health and social work	1326516	-0.30	-0.20
Other community, social and personal service activities	1234931	-0.30	-0.20
Activities of households [2)]			
Total	**38552800**	**-0.20**	**-0.20**

1) Includes also repair of motor vehicles, motorcycles, and personal and household goods.
2) Blank fields indicate missing values in the I/O-tables.

Source: Own estimates and simulation, see text.

6.3.4 Poland

In the aftermath of EU-enlargement unemployment in Poland was high at 19.6 per cent. Additionally, the compensation of employees was at 28.8 per cent of the EU-25 and thus below the average of NMS-8 countries (29.7 per cent). Emigration from poland therefore was strong; 666,000 migrants left Poland in the aftermath of the EU-enlargement Nevertheless, the Polish participation rate was low with 51 per cent, which reduces the impact of the migration shock on the Polish economy. The reduction of labour force is with 1.71 per cent below the population shock, but still strong. Hence, we can expect large macroeconomic effects.

Table 25: Simulation results Poland, key macroeconomic figures

		Enlargement effect	Free movement effect
	Base year	2004-2007	2008-2011
		Changes in per cent	
GDP	843156	-0.92	-0.01
GDP per capita	22061	0.81	0.02
Private consumption	546077	-0.75	0.00
Investment	158028	-0.78	0.00
Government consumption	165567	-0.88	0.00
Taxes	108194	-0.84	0.00
Exports intra EU	185441	-1.25	-0.01
Exports extra EU	83540	-1.24	-0.01
Imports intra EU	-179284	-0.80	0.00
Imports extra EU	-116214	-0.81	0.00
Wages	24	0.32	0.01
Capital	412916	-0.64	0.00
Labour force	16946	-1.71	-0.02
		Changes in percentage points	
Unemployment rate	20	-0.48	-0.01

Source: Own estimates and simulation, see text.

Emigration from Poland leads to a strong decrease in GDP (see Table 25). In the enlargement scenario, migration reduces GDP by 0.92 per cent. As we see in both scenarios, trade is strongly affected by the labour supply shock. Intra-EU and Extra-EU exports are declining by roughly 1.25 per cent and imports decline by 0.8 per cent. Consequently, the trade balance is worsening. The strong decline in trade indicates a

redistribution of production among sectors (see Table 26). We can see, that tradable sectors like manufacturing reduce their production by 1 per cent, while service sectors like hotel and restaurant reduce their production by 0.8 per cent, only. However, most other service sectors reduce their production like the average of all sectors by 0.9 per cent. Nevertheless, the labour supply shock enhances wages by 0.32 per cent and strongly reduces unemployment by 0.48 percentage points.

The effects of the free movement scenario are negligible in all categories due to the diminutive decrease of labour supply with free movement of workers to all EU-countries.

Table 26: Simulation results Poland, sectoral impact

		Enlargement effect	Free movement effect
	Base year	2004-2007	2008-2011
		Changes in per cent	
Agriculture, hunting and forestry	78123	-0.80	0.00
Fishing	476	-0.90	0.00
Mining and quarrying	26835	-1.00	-0.10
Manufacturing	493498	-1.00	0.00
Electricity, gas and water supply	68749	-0.80	0.00
Construction	115113	-0.80	0.00
Wholesale and retail trade [1)]	260694	-0.90	0.00
Hotels and restaurants	19457	-0.80	0.00
Transport, storage and communication	128485	-0.90	0.00
Financial intermediation	55051	-0.80	0.00
Real estate, renting and business activities	192624	-0.80	0.00
Public administration and defence; compulsory social security	63339	-0.90	0.00
Education	44994	-0.90	0.00
Health and social work	46915	-0.90	0.00
Other community, social and personal service activities	51825	-0.90	0.00
Activities of households	5275	-0.70	0.00
Total	**1651452**	**-0.90**	**0.00**

1) Includes also the repair of motor vehicles, motorcycles, and personal and household goods.

Source: Own estimates and simulation, see text.

6.3.5 Slovenia

In the aftermath of EU-enlargement, unemployment in Slovenia was comparatively low at 6.7 per cent. The compensation of employees was with 57.7 per cent of the EU-25 average well ahead of the NMS-8 figure of 29.7 per cent. Migration thus affected the Slovenian economy only slightly. We estimated a migration effect of EU-enlargement which is even lower than the counterfactual assumption of no enlargement. However, numbers are small, 5100 emigrants stay after EU-enlargement in Slovenia and do not move into the EU-15 countries.

Table 27: Simulation results Slovenia, key macroeconomic figures

		Enlargement effect	Free movement effect
	Base year	2004-2007	2008-2011
		Changes in per cent	
GDP	5813540	0.17	-0.38
GDP per capita	2914007	-0.06	0.16
Private consumption	3332074	0.14	-0.31
Investment	1433367	0.15	-0.33
Government consumption	1213919	0.17	-0.37
Taxes	864309	0.16	-0.36
Exports intra EU	1746315	0.20	-0.45
Exports extra EU	1223014	0.20	-0.45
Imports intra EU	-2284272	0.16	-0.35
Imports extra EU	-850877	0.16	-0.36
Wages	3363	-0.05	0.13
Capital	1936348	0.10	-0.20
Labour force	959	0.23	-0.54
		Changes in percentage points	
Unemployment rate	7	0.03	-0.07

Source: Own estimates and simulation, see text.

Slovenia is an exception in the countries analysed in this chapter. The EU enlargement has lead to a lower migration than we would predict without enlargement. Therefore, the GDP and the unemployment rate are higher while GDP per capita and wages are lower with enlargement. This effect is only reversed if all countries allow free movement of workers from the NMS-8. In the free movement scenario the labour force in Slovenia is reduced by 0.54 per cent. Therefore, the usual pattern of sending countries is reached, the GDP declines by 0.38 per cent and GDP per capita rises by 0.16 per cent. Intra-EU and Extra-EU exports and imports react very similar in this scenario. While exports are

reduced by 0.45 per cent more strongly than imports (0.35 per cent), the trade balance is slightly worsening.

The sectoral structure of Slovenia shows a shock which enhances production in all sectors equally (see Table 28). Thus, we see no big divergence in tradable and non-tradable goods in the enlargement scenario. The stronger reduction of exports in the free movement scenario follows a reduction of manufacturing production by 0.4 per cent, which is above the average of 0.3 per cent.

Table 28: Simulation results Slovenia, sectoral impact

		Enlargement effect	Free movement effect
	Base year	2004-2007	2008-2011
		Changes in per cent	
Agriculture, hunting and forestry	294424	0.10	-0.20
Fishing	2226	0.20	-0.30
Mining and quarrying	50559	0.20	-0.30
Manufacturing	4247767	0.20	-0.40
Electricity, gas and water supply	307089	0.20	-0.30
Construction	1065401	0.20	-0.30
Wholesale and retail trade [1)]	1134677	0.20	-0.30
Hotels and restaurants	243865	0.20	-0.30
Transport, storage and communication	868086	0.20	-0.30
Financial intermediation	372874	0.20	-0.30
Real estate, renting and business activities	1305820	0.20	-0.30
Public administration and defence; compulsory social security	524485	0.20	-0.30
Education	376102	0.20	-0.30
Health and social work	400073	0.20	-0.30
Other community, social and personal service activities	325362	0.20	-0.30
Activities of households	1336	0.20	-0.30
Total	**11520146**	**0.20**	**-0.30**

1) Includes also the repair of motor vehicles, motorcycles, and personal and household goods.

Source: Own estimates and simulation, see text.

6.3.6 Slovakia

Slovakia is a small country which is heavily affected by migration. In the aftermath of EU-enlargement, unemployment in Slovakia was comparatively high at 17.6 per cent and therefore higher than in all other NMS-8 countries except Poland. The compensation of employees was with 23.2 per cent of the EU-25 average lower than in all other NMS-8 countries. Migration thus affected the Slovakian economy heavily. We estimated a migration effect of EU-enlargement of 72,000 emigrants, which is high compared to the small size of Slovakia.

The GDP in Slovakia is reduced by 0.44 per cent due to enlargement. Interestingly, exports are reacting half as much to the migration shock than imports (see Table 29). This indicates strong differences in the reduction of production among sectors. Furthermore, Intra-EU and Extra-EU exports (0.26 / 0.27 per cent) and imports (0.54 per cent) are reacting very similarly.

The opening up of labour markets in the remaining EU-15 countries does not lead to strong effects in Slovakia. Surprisingly, migration is slightly higher with transitional periods than with free movement. Therefore, we see a small increase in GDP and lower GDP per capita due to a lower reduction in labour supply with free movement. However, these effects are extremely small.

Table 29: Simulation results Slovakia, key macroeconomic figures

		Enlargement effect	Free movement effect
	Base year	2004-2007	2008-2011
		Changes in per cent	
GDP	1357312	-0.44	0.03
GDP per capita	252328	0.81	-0.08
Private consumption	762032	-0.63	0.05
Investment	356776	-0.61	0.04
Government consumption	275032	-0.72	0.05
Taxes	138065	-0.54	0.04
Exports intra EU	859842	-0.26	0.01
Exports extra EU	153022	-0.27	0.01
Imports intra EU	-796449	-0.54	0.04
Imports extra EU	-252944	-0.54	0.04
Wages	231	0.34	-0.03
Capital	719469	-0.46	0.03
Labour force	2624	-1.23	0.10
		Changes in percentage points	
Unemployment rate	18	-0.45	0.04

Source: Own estimates and simulation, see text.

The production in Slovakia is reduced by 0.6 per cent in the enlargement scenario (see Table 30). Nevertheless, manufacturing is only reduced below average (0.4 per cent), while the non-tradable sectors reduce production more heavily (0.6 to 0.7 per cent). Hence, the sectoral structure is heavily affected by the migration shock.

Table 30: Simulation results Slovakia, sectoral impact

		Enlargement effect	Free movement effect
	Base year	2004-2007	2008-2011
		Changes in per cent	
Agriculture, hunting and forestry	111422	-0.60	0.00
Fishing	595	-0.60	0.10
Mining and quarrying	13084	-0.70	0.00
Manufacturing	1176469	-0.40	0.00
Electricity, gas and water supply	246955	-0.60	0.00
Construction	219925	-0.70	0.10
Wholesale and retail trade [1)]	342576	-0.50	0.10
Hotels and restaurants	35122	-0.70	0.10
Transport, storage and communication	252829	-0.60	0.00
Financial intermediation	79830	-0.60	0.10
Real estate, renting and business activities	274403	-0.60	0.00
Public administration and defence; compulsory social security	129796	-0.70	0.00
Education	53273	-0.70	0.00
Health and social work	64502	-0.70	0.00
Other community, social and personal service activities	72893	-0.70	0.00
Activities of households			
Total	**3073675**	**-0.60**	**0.10**

1) Includes also repair of motor vehicles, motorcycles, and personal and household goods.
2) Blank fields indicate missing values in the I/O-tables.

Source: Own estimates and simulation, see text.

6.4 Conclusions

In this section we addressed the trade and sectoral effects of labour mobility within a CGE-model. As our results show, countries are reacting very differently to the labour supply shock: In Germany, exports are affected nearly twice as much from the migration shock than imports, while in the UK these differences are much smaller. This reflects the different trade structure and the different degree of openness of the two countries.

However, differences occur also among sending countries: In Hungary and Slovenia we observe only a slight departure from the pre-shock sectoral production structure, while in Slovakia we observe a strong sectoral redistribution of factors.

Nevertheless, our results predict moderate effects of migration on wages and unemployment on the aggregate level. In brief, our results can be summarised as follows:

First, migration effects are mitigated in case of a partial adjustment of the capital stock. Second, we observe strong trade effects which mitigate the migration shock and foster the redistribution of factors among tradable goods and non-tradable goods in some countries. Third, a redistribution of factors leads in Slovakia to differences in the distribution of production among sectors between simulated and initial values.

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8 Appendix

8.1 Appendix A

Table A1: The short-run effects of transitional arrangements and the free movement of workers from the NMS-8 on the structure of wages and unemployment, 2008-2011

	Wages				Unemployment			
	All	Low-skilled	Medium-skilled	High-skilled	All	Low-skilled	Medium-skilled	High-skilled
	Changes in per cent (unemployment rate: changes in percentage points)							
AT	-0.02	-0.02	-0.02	-0.02	0.02	0.03	0.01	0.07
BE	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	0.00
DE	-0.08	-0.08	-0.08	-0.08	0.08	0.12	0.07	0.08
DK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FI	-0.03	-0.03	-0.03	-0.04	0.03	0.04	0.04	0.02
FR	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00
GR	-0.02	-0.02	-0.03	-0.01	0.02	0.01	0.02	0.01
IE	0.44	0.47	0.50	0.38	-0.23	-0.36	-0.23	-0.09
IT	-0.01	-0.01	-0.01	-0.01	0.00	0.01	0.00	0.00
LU	0.05	0.03	0.03	0.12	-0.02	-0.01	-0.01	-0.09
NL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SE	-0.01	-0.01	-0.01	-0.01	0.01	0.01	0.01	0.01
UK	0.07	0.08	0.08	0.05	-0.05	-0.07	-0.06	-0.01
CZ	0.08	0.08	0.07	0.11	-0.06	-0.37	-0.04	-0.01
EE	0.09	0.10	0.09	0.09	-0.07	-0.12	-0.07	-0.03
HU	0.08	0.07	0.08	0.09	-0.03	-0.08	-0.03	-0.01
LT	0.03	0.03	0.03	0.04	-0.03	-0.07	-0.03	-0.02
LV	0.04	0.04	0.04	0.04	-0.03	-0.05	-0.03	-0.01
PL	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	0.00
SI	0.09	0.13	0.09	0.08	-0.05	-0.10	-0.04	-0.02
SK	-0.03	-0.03	-0.03	-0.04	0.04	0.12	0.04	0.02
EU-15[1)]	**0.00**	**0.01**	**-0.01**	**-0.01**	**0.01**	**0.01**	**0.02**	**0.02**
NMS-8	**0.04**	**0.04**	**0.03**	**0.05**	**-0.01**	**-0.04**	**-0.01**	**0.00**
Total	**0.00**	**0.01**	**-0.01**	**0.00**	**0.01**	**0.00**	**0.01**	**0.02**

1) Without Portugal.

Source: Own estimates and simulation, see text.

Table A2: The short-run effects of transitional arrangements and the free movement of workers from the NMS-2 on the structure of wages and unemployment, 2008-2014

	Wages				Unemployment			
	All	Low-skilled	Medium-skilled	High-skilled	All	Low-skilled	Medium-skilled	High-skilled
	Changes in per cent (unemployment rate: changes in percentage points)							
AT	-0.02	-0.02	-0.01	-0.03	0.03	0.05	0.00	0.14
BE	0.01	0.01	0.01	0.02	-0.02	-0.05	-0.01	-0.02
DE	-0.06	-0.06	-0.06	-0.06	0.06	0.09	0.05	0.05
DK	-0.01	-0.01	-0.01	-0.01	0.01	0.00	0.00	0.02
ES	0.12	0.11	0.36	0.01	-0.16	-0.15	-0.34	-0.01
FI	0.00	0.00	0.00	-0.01	0.00	0.01	0.00	0.01
FR	0.00	0.00	0.01	0.00	-0.01	-0.01	-0.01	-0.01
GR	-0.09	-0.12	-0.10	-0.05	0.07	0.08	0.08	0.04
IE	-0.24	-0.23	-0.25	-0.23	0.12	0.18	0.13	0.06
IT	-0.04	-0.04	-0.04	-0.03	0.03	0.03	0.04	0.02
LU	-0.01	-0.01	-0.01	-0.01	0.00	0.00	0.01	0.01
NL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SE	0.00	-0.01	0.00	0.00	0.01	0.01	0.00	0.00
UK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BG	0.17	0.16	0.15	0.19	-0.21	-0.39	-0.16	-0.13
RO	0.04	0.04	0.04	0.05	-0.03	-0.03	-0.03	-0.03
EU-15[1)]	**-0.01**	**0.00**	**-0.01**	**-0.02**	**0.00**	**-0.01**	**0.00**	**0.01**
NMS-2	**0.07**	**0.05**	**0.06**	**0.10**	**-0.08**	**-0.13**	**-0.07**	**-0.08**
Total	**-0.01**	**0.00**	**-0.01**	**-0.02**	**-0.01**	**-0.02**	**0.00**	**0.01**

1) Without Portugal.

Source: Own estimates and simulation, see text.

8.2 Appendix B

In this Appendix the key equations of the theoretical CGE model are explained. The Appendix is divided in six sections which describe the modeling of production, consumption, trade, the income of households, the government and the equilibrium conditions.

The domestic production

The production in the model is organized by activities. These activities use labour and capital on the one hand and intermediaries on the other hand to produce final output. The production function is therefore nested. The upper nest describes the combination of value added and intermediaries, while the lower nest describes the production of value added by the combination of labour and capital. If there are different kinds of labour or capital, the combination of each type to composite labour or composite capital is done in the lowest nest.

The production of value added is described by a CES production function. The factors of production are imperfect substitutes while the variable $QF_{f,a}$ can be either labour or composite labour reflecting lower nests.

$$\mathrm{QVA}_{\alpha} = \alpha_{a}^{va}\left(\sum_{f\in F}\delta_{fa}^{va}\mathrm{QF}_{f,a}^{-\rho_{a}^{va}}\right)^{\frac{1}{\rho_{a}^{va}}} \quad \text{(B.1)}$$

where

$f \in F$ factor f is element of the set of factors

QVA_a value added in quantity units

$QF_{f,a}$ factor demand by activities a

a_a^{va} efficiency parameter of the CES value added function

$\delta_{f,a}^{va}$ share parameter of factor f in activity a

ρ_a^{va} exponent of the CES value added function

Factor demand is derived according to the profit maximation hypothesis. Every factor is used up to the quantity where it's marginal return equates marginal costs.

$$WF_f \overline{WFDIST}_{f,a} = PVA\left(1-tva_a\right)QVA\left(\sum_{f\in F'}\delta_{f,a}^{va}QF_{f,a}^{-\rho_a^{va}}\right)^{-1}\delta_{f,a}^{va}QF_{f,a}^{-\rho_a^{va}-1} \quad \text{(B.2)}$$

where

tva_a value added tax for activity a

PVA_a price of value added

WF_f price of factor f

$\overline{WFDIST}_{f,a}$ distribution factor for wages of factor f in activity . (exogen)

The upper nest of the production function combines intermediaries and value added. According to different production structures along activities, different production-functions, CES or Leontief have to be used in this nest.

The intermediary goods demanded by each activities are in turn produced by different activities. Therefore demand of intermediaries is demand to a composite good produced by different activities. The share of each product in this set is determined according to cost minimization and therefore relative prices.

Extra and Intra-EU Trade

Whether a final product is consumed domestically or exported into another EU-country or outside the EU is determined by profit maximization. Therefore a CET function is used to allocate production to domestic use or Intra-EU and Extra-EU exports.

$$QX_c = \alpha_c^t\left(\delta_c^t QE_c^{\rho_c^t}\left(1-\delta_c^t\right)QD_c^{\rho_c^t}\right)^{\frac{1}{\delta_c^t}} \quad \text{(B.3)}$$

with

QX_c quantity of the production of good c

QD_c quantity of production sold domestically

QE_c quantity of production exported c

α_c^t displacement parameter of the CET function

δ_c^t share parameter of the CET function

ρ_c^t exponent of the CET function

Imports are treated similar to exports. The quantity of imports is determined by a CET-type Armington function. Additionally, imports and domestic products are only imperfect substitutes. This reduces the impact of world prices on domestic prices and consumption.

$$QQ_c = \alpha_c^q \left(\delta_c^q QM_c^{-\rho_c^q} + \left(1-\delta_c^q\right) QD_c^{-\rho_c^q} \right)^{\frac{1}{\rho_c^q}} \quad \text{(B.4)}$$

with

QQ_c domestic supply

QM_c quantity of imports

α_c^q shift parameter of the Armington function

δ_c^q share parameter of the Armington function

ρ_c^q exponent of the Armington funktion

The income of nongovernmental institutions

Nongovernmental Institutions receive wages and capital income from their factor endowments. Additionally they receive transfers from the state or other domestic or foreign nongovernmental institutions. These earnings are spent for consumption, savings, taxes, or transfers.

$$YI_i = \sum_{f \in F} YIF + \sum_{i'=INSDNG'} TRII_{i,i'} + transfr_{i,gov}\overline{CPI} + transfr_{i,row} EXR + transf_{eu} EXREU \quad \text{(B.5)}$$

with

YI_i Income of Institution i

$YIF_{i,f}$ Income of institution i from factor f

$TRII_{i,i'}$ transfers from institution i to instirtution i'

$shif_{i,f}$ share of income from factor f by domestic nongovernmental institutions

tf_f direct tax on factor f

$transfr_{i,gov}$ transfers from government to institution i

$transfr_{i,row}$ transfers from ROW-countries to institution i

$transf_{eu}$ transfers from EU-countries to institution i

$\overline{CPI}$ consumer price index

Income from labour is divided in earned income and unemployment benefits. The relationship between unemployment and wages is specified by a wage curve. Therefore labour market rigidities in different countries can be considered.

The domestic consumption

The domestic demand is divided into household consumption and investment demand of enterprises. Since investment demand is equal to household savings, it is discussed in the equilibrium section.

The consumption of households is a function of disposable income and is derived from a Stone-Geary demand function:

$$PQ_c QH_{c,h} = PQ_c \gamma^m_{c,h} + \beta^m_{c,h} \left(EH_h - \sum_{c' \in C} PQ_c \gamma^m_{c',h} - \sum_{a \in A} \sum_{c' \in C} PXAC_{a,c'} \gamma^h_{a,c',h} \right) \quad \text{(B.6)}$$

with

$QH_{c,h}$ consumption of good c by household h

$\gamma^m_{c,h}$ consumption of home produced good c by household h

$\beta^m_{c,h}$ household h marginal share of consumption expenditure for good c

The household maximizes a Stone-Geary utility function with regard to her budget constraints.

The government

The State in the model is financed by taxes, customs duties, credit, and transfers by other institutions. The income of the state is spent for consumption of goods, investment, transfers, and savings.

$$YG = \sum_{i \in INSDNG} TINS_i YI_i + \sum_{f \in F} tf_f YF_f + \sum_{a \in A} tva_a PVA_a QVA_a$$
$$+ \sum_{a \in A} ta_a PA_a QA_a + \sum_{c \in CM} tm_c pwm_c QM_c EXR + \sum_{c \in CE} te_c pwe_c QE_c EXR$$
$$+ \sum_{c \in C} tq_c PQ_c QQ_c \sum_{f \in F} YIF_{gov} + trnsf_{gov,row} EXR$$

(B.7)

with

YG state income

The equilibrium conditions

The model is closed by solving five equilibrium conditions, market clearing on factor and goods markets, an even balance of payments, a balanced budget of the state sector and saving equal investment. The goods markets are in equilibrium if supply equals demand, while the governmental sector is in equilibrium if income equals spending. Therefore governmental savings have to be flexible. The third equilibrium condition is saving-investment equilibrium, where savings have to equal investment.

Forth, the factor market reach equilibrium if supply of a factor meets its demand. The supply of factors is exogenous.

$$\sum_{a \in A} QF_{f,a} = \overline{QFS}$$

(B.8)

with

$\overline{QFS}_f$ quantity of factor f

In the labour markets, supply of labour is additionally restricted by labour market rigidities. Therefore a wage-curve describes the unemployment rate at a specific wage level.

The equilibrium of the balance of payments is solved separately for Intra-EU and Extra-EU trade, reflecting quasi fixed exchange rates in the EU.

(B.9)

$$\sum_{c \in CM} pmrw_c QMRW_c + \sum_{f \in F} trnsfr_{rdw,f} = \sum_{c \in CE} perw_c QERW_c + \sum_{i \in INSD} trnsfr_{i,rdw} + \overline{FSAV_{eu}} + \overline{FSAV_{rdw}}$$

with

$\overline{FSAV}_{rdw}$ Foreign savings (Extra-EU) in foreign currency units

$\overline{FSAV}_{eu}$ Foreign savings (Intra-EU) in foreign currency units

8.3 Appendix C

Figure C 1: Social accounting matrix

	Expenditures								
Receipts	Activities	Commodities	Factors	Housholds	Enterprises	Government	Savings/ Investment	Rest of World	Total
Activities		Marketed outputs		Home-consumed outputs					Activity income
Commodities	Intermediate Inputs	Transaktions-kosten		Private consumption		Government consumption	Investment	Exports	Demand
Factors	Value-added							Factor income from RoW	Factor income
Housholds			Factor income to housholds	Transfers to housholds	Surplus to housholds	Transfers to housholds		Transfers to housholds	Housholds income
Enterprises			Factor income to enterprises			Transfers to enterprises		Transfers to enterprises	Enterprise income
Government	Producer taxes, value added tax	VAT,	Factor income to government, Income taxes		Surplus to government, direct tax			Transfers to Government	Government income
Savings/ Investment				Savings of Housholds	Savings of enterprises	Government savings		RoW savings	Savings
Rest of World		Imports			Surplus to RoW	Transfers to RoW			Foreign exchange outflow
Total	Activity	Supply expenditures	Factor expenditures	Houshold expenditures	Enterprise expenditures	Government expenditures	Investment	Foreign exchange inflow	

Source: IFPRI (2002)