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# Forecasting potential migration from the New Member States into the EU-15: Review of Literature, Evaluation of Forecasting Methods and Forecast Results

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## Abstract

In this background report we review the literature on migration forecasts, evaluate different methods for forecasting migration and present a new approach to forecast the migration potential from the new member states (NMS) into the EU-15. There has been a large literature attempting to forecast the migration from the NMS before enlargement. At a long-run migration potential of about 3 to 5 per cent of the population and an influx of between 200,000 and 300,000 persons, the mainstream of these forecasts is by and large consistent with the actual migration movements from the NMS-8 into the EU-15, while the migration potential from Bulgaria and Romania has been underestimated. Moreover, these studies employed explicitly or implicitly the counterfactual assumption that all EU-15 countries will open their labour markets at the same time, such that they were not able to forecast the substantial changes in regional migration patterns which took place after EU enlargement. While this literature had to rely on coefficients from other countries, the post-Enlargement migration enables us to exploit information on recent migration stocks and flows for forecasts of the migration potential. However, the selective application of transitional arrangements for the free movement of workers has distorted bilateral migration patterns, such that the coefficients derived from bilateral migration movements are likely to be biased. We therefore refer to the EU-15 as a single destination which allows us to circumvent this problem. Moreover, we use information on migration stocks and flows within the EU countries to estimate the migration potential under the conditions of free movement. Based on this approach, we estimate the long-run migration potential from the NMS-8 at about 6 per cent of the population in the sending countries, and the migration potential from the NMS-2 (Bulgaria and Romania) at about 14 per cent of the population in the sending countries. The short-run net inflow of migrants from the NMS-8 is estimated to be at about 240,000 persons p.a., and that from the NMS-2 at about 190,000 persons p.a. These net inflows may decline in the course of the financial crisis, since immigration and return migration are largely determined by the conditions in host countries.

## Contents

# 1 Introduction

This background report briefly reviews the literature on forecasts of the migration potential from the new member states (NMS), discusses the forecasting methods and their theoretical foundations, and presents a projection for the migration potential from the NMS based on new estimates which considers recent migration movements.

There has been a large literature attempting to forecast the migration from the NMS before enlargement. At a long-run migration potential of about 3 to 5 per cent of the population and an influx of between 200,000 and 300,000 persons, the mainstream of these forecasts are by and large consistent with the actual migration movements from the NMS-8 into the EU-15, while the migration potential from Bulgaria and Romania has been underestimated. In the course of the selective application of the transitional arrangements, the spatial distribution of migrants across the EU-15 countries has changed dramatically. As a consequence, forecasts for individual EU member states carried out under the counterfactual assumption that all EU member states open their labour markets at the same time deviate largely from actual migration patterns which have emerged after EU enlargement.

The data available since the EU's Eastern enlargement enables us to apply a new approach for projecting the migration potential. The studies carried out prior to enlargement had to rely on data and, hence, the experience from other migration episodes, since immigration from the NMS was hampered by the iron curtain and, after the breakdown of the Berlin wall, by immigration restrictions in the EU-15. All studies therefore transferred elasticities estimated for other country groups to the NMS. This requires that the estimated coefficients are not only constant across time, but also across space. Since the migration behaviour is heterogeneous across countries, this is an important drawback of the projections carried out before enlargement. Meanwhile, we can use the data since enlargement for the identification of the relevant parameters for the NMS themselves.

Most migration forecasts rely explicitly or implicitly on the assumption of the irrelevance of independent alternatives, i.e. that economic or institutional variables in third countries do not affect the scale of migration in another country. If this assumption is not valid, the estimated coefficients are biased. This is particularly relevant in the context of the EU's Eastern enlargement, since the selective application of transitional arrangements has certainly affected bilateral migration patterns. We circumvent this problem by estimating the migration potential for the EU-15 as an aggregate. As a consequence, we cannot forecast the impact of removing immigration barriers on individual destinations such as Austria and Germany. This is in our view not possible, since the selective application of immigration barriers and the subsequent diversion of migration stocks and flows has no precedent in history, such that no counterfactual evidence exists on which we can base our estimates.

We find that the projected migration potential from the NMS-8 is close to what we would expect under the conditions of free movement for the other EU-15 member states.

Altogether, the long-run migration potential from the NMS-8 is estimated to be at about 5 per cent of the population, and that from the NMS-2 at about 10 per cent in case of an EU-wide introduction of a free movement. Needless to say that these forecasts rely on a number of strong assumptions and provide no more than a hint to the actual magnitudes involved.

The remainder of this background report is organised as follows. Section 2 briefly reviews the literature on forecasts of the migration potential from the NMS, which have mainly been carried out before EU enlargement. Section 3 outlines the theoretical and empirical framework for the estimation of the migration potential from the NMS under consideration of the relevant literature. Section 4 describes the data base which is employed in the estimation of the parameters of our model and Section 5 presents the estimation results. Section 6 simulates the migration potential from the NMS-8 and the NMS-2 into the EU-15 under the status quo conditions and under free movement. Finally, Section 7 discusses how actual migration patterns may deviate from our simulations under the conditions of the financial crisis.

## 2 A review of the literature

There have been numerous studies attempting to forecast potential migration from the NMS before enlargement. Theoretical backgrounds, methodologies and data bases employed by these studies vary widely. The overwhelming share of these studies obtained nevertheless remarkably similar results. The mainstream of these studies has estimated the long-run stock of residents from the NMS at between 3 and 5 per cent of the population in the origin countries, while annual net migration flows have been predicted to be between 300,000 and 400,000 persons in the first years following enlargement, which corresponds to 0.3-0.4 per cent of the population in the countries of origin (see e.g. Alvarez-Plata et al., 2003; Boeri/Brücker, 2001; Bruder, 2003; Hille/Straubhaar, 2001; Krieger, 2003; Layard et al., 1992; Zaiceva, 2006). Some studies have, however, obtained lower (Fertig, 2001; Fertig and Schmidt, 2001; Dustmann et al., 2003; Pytlikova, 2007) and higher projections (Flaig, 2001; Sinn et al., 2001).

These migration forecasts rely on the counterfactual assumption that all Member States of the EU-15 open their labour markets at the same time. The selective application of transitional arrangements for the free movement of workers by the EU-15 countries has, however, affected both the scale and the direction of migration from the NMS. The authors of many studies were aware of this before enlargement:

> *„The transitional periods can distort the regional distribution of migrants from the CEECs across the EU-15, that is, the diversion of migration flows away from countries which restrict immigration into countries which pursue a more liberal immigration policy."* (Alvarez-Plata et al., 2003, S. 43).

However, missing historical evidence did not allow for estimating the potential diversion of migration flows triggered by the selective application of transitional arrangements in the EU-15. Therefore, the migration forecasts carried out before enlargement cannot be falsified by the developments following enlargement, since the actual legal and institutional conditions differ from those explicitly or implicitly assumed by the migration projections. Nevertheless, at an annual net migration flow of between 200,000 and 250,000 persons from the NMS-8 into the EU-15, the post-enlargement experience does not contradict the aggregate figures of most projections, although migration flows into Ireland and the UK have exceeded the forecasted figures largely.

There are essentially three methods which have been used for forecasting the potential flows of migration from the NMS. The first derives medium- and long-term migration forecasts from surveys of migration intentions in the sending countries. The second extrapolates the South-North migration flows in Europe during the 1960s and early 1970s to future East-West migration. Finally, the third and largest part of the literature bases migration forecasts on econometric models, which explain migration stocks and flows by economic and institutional variables.

In this section we briefly outline the methodological foundations and the results which are obtained from these three methods. For previous literature reviews see Brücker and Siliverstovs (2006a; 2006b), Fassmann and Münz (2002), Hönekopp (2001), Straubhaar (2002) and Zaiceva and Zimmermann (2007).

### 2.1 Surveys of migration intentions

A number of studies base forecasts of potential migration on surveys of migration intentions in the NMS (Fassmann and Hintermann, 1997; Wallace, 1998; Krieger, 2003; Fassmann and Münz, 2002; see also Fouarge and Ester, 2007). Krieger (2003) is based on the Eurobarometer Labour Mobility Survey, which covers all accession countries; the other studies are based on smaller surveys which focus only on a limited number of countries.

Studies of migration intentions face several methodological problems. First, and most importantly, it is unclear whether or when the expressed migration intention will be realised, and if so, how long an individual will actually stay abroad. As an example, only a small fraction of the East German individuals who revealed a migration intention in the German Socio-Economic Panel (GSOEP) in 1991 have actually moved five years later (Schwarze, 1997), while Gordon and Molho (1995) report evidence that 90 per cent of the individuals who intended to move have actually moved in the UK. Therefore, these studies use additional questions regarding job search activities in foreign countries, employment and housing contracts etc. for the identification of serious migration intentions for forecasts of potential migration. As a result, potential migration is estimated to be at between one-third and two-fifth of general migration intentions revealed in opinion polls (Fassmann/Hintermann, 1997; Krieger, 2003).

Second, the migration intentions revealed in surveys differ substantially depending on the questionnaire and other aspects of the survey design. Third, it is unclear whether migration intentions refer to a situation without legal barriers to migration or whether migration intentions reflect institutional barriers and are therefore a biased measure for migration under the conditions of free movement. Many of these problems could be circumvented by panel studies which would allow one to show whether migration intentions are realised or not. Unfortunately, panel studies of migration intentions do not yet exist in the NMS.

However, surveys of migration intentions can provide valuable information which is not available from other studies. First, they deliver important insights on the human capital characteristics of potential migrants (see Fouarge and Ester, 2007; Krieger, 2003, for a detailed analysis). Second, the latest Eurobarometer survey provides information on the destination countries, which may help to analyse the spatial distribution of migrants from the NNS across the EU Member States.

According to Fouarge and Easter (2007), 7.4 per cent of the population in the NMS have revealed a general migration intention in the 2005 wave of the Eurobarometer Mobility Survey, compared to 2.4 per cent in the 2002 wave. It is not clear whether the difference between the two waves can be attributed to a higher propensity to move since the questionnaire has changed between the two waves. It is also worthwhile noting that 5.0 per cent of the EU-15 population have announced a general intention to move in the 2005 Eurobarometer survey, although migration stocks from these countries number less than 3 per cent in the EU-15.

By and large, the findings of the Eurobarometer survey are consistent with those in the 1995 wave of the International Social Survey Programme (ISSP), although considerable differences exist in individual countries. Similarly, Fassmann and Hintermann (1997) and Wallace (1998) find general migration intentions between 3 and 30 per cent of the population. Following these studies, the actual migration potential derived from the general migration intentions is estimated at about 3 per cent of the population in the NMS, while the findings for Bulgaria and Romania are slightly above the NMS-8 average (see Krieger, 2003; Fassmann and Hintermann, 1997; Wallace, 1998).

### 2.2 Extrapolation studies

The extrapolation of South-North to East-West migration in Europe relies on the hypothesis that the economic and institutional conditions of "guestworker" migration in the 1960s and early 1970s resemble migration conditions in the enlarged EU of today. Under this assumption, about 3 per cent of the population from the NMS would move to the EU-15 within 15 years (Layard et al., 1992). Thus, the results are very similar to the estimates of the 'actual migration potential' derived from surveys of migration intentions.

The income difference measured in purchasing power parities between the EU-15 and the NMS-8 is indeed similar to that between the members of the then European Economic Community (EEC) and their neighbours in Southern Europe during the 1960s. However, there are also important differences between the current enlargement and previous episodes. First, the present per capita GDP gap between the EU-15 and the NMS-8 at current exchange rates is substantially larger than that between the North and the South in Europe during the 1960s. Income differences at current exchange rates may affect migration decisions since a part of the income obtained in host countries can be consumed in the sending countries. Second, labour market conditions (such as unemployment rates) in the main destination countries in the EU-15 are generally less favourable today compared to those in Europe during the 1960s. Third, transport and communication costs are substantially lower today compared to the 1960s, which in turn reduces migration costs. Finally, the institutional and legal framework for migration was different during the guestworker recruitment period compared to the legal framework for the free movement of workers in the Community of today.

### 2.3 Forecasts based on econometric models

The largest part of the migration forecasts relies on econometric models, which explain migration flows or stocks by economic and institutional variables. The key explanatory variables are in most models the wage and (un-)employment rates in the receiving and sending countries, the (lagged) migration stock, and a number of dummy variables capturing institutional conditions in the destination and sending countries, particularly legal immigration barriers.

Although the theoretical foundations differ, most macro migration models are remarkably similar with respect to the variables they consider and regarding their functional forms (see Section 3 for a detailed discussion).[1] One important difference in the literature is between stock and flow models, which need, however, not necessarily yield different estimates of the migration potential if properly applied.[2] A second difference is the identifying restrictions which are imposed by different estimators. Both methodological arguments and tests of the forecasting performance suggest that standard fixed effects models outperform pooled OLS models as well as most sophisticated heterogeneous estimators (Alvarez-Plata et al., 2003; Brücker and Siliverstovs, 2006a; 2006b).

Table 2.1 summarises the estimation results of different studies including their data source and methodological foundations. The estimation results for migration stocks and flows are expressed in per cent. This allows one to compare the findings, since the sample of sending countries differs across the studies.[3] We can distinguish studies which refer to Germany, the UK and the total EU-15 as a destination, where the latter studies are based on estimates for a panel of destination and sending countries. The large number of studies in the literature which refer to Germany can be traced back to the fact that about 60 per cent of the immigrants from the NMS in the EU-15 resided in Germany

[1] For derivations of macro migration functions from theoretical models, see inter alia Hatton (1995), Daveri and Faini (1995), Faini and Venturini (1995) and Brücker and Schröder (2006).

[2] The majority of the models in the empirical literature are specified as gross- or net flow models (e.g. Hatton, 1995; Hille and Straubhaar, 2001; Pederson et al., 2004; Pytlikova, 2007). These models rely explicitly or implicitly on the assumption of a representative agent, i.e. that individuals do not differ with regard to their preferences or human capital characteristics relevant for migrations. In contrast, stock models are derived from the assumption that individuals are heterogeneous, such that an equilibrium migration stock is achieved when the benefits from migration equals its costs for the marginal individual (Brücker and Schröder, 2006).

[3] Note that Table 2.1 is a selection of the literature. There exist numerous other studies which, by and large, resemble the findings represented in this table.

before enlargement. Moreover, the German migration statistics provides detailed data on migration stocks and flows by country of origin which facilitates migration estimates compared to many other destinations in the EU-15. Many studies have therefore estimated the migration potential for Germany and than extrapolated the estimate to the EU-15 under the counter-factual assumption that all EU Member States will open their labour markets at the same time and that the regional distribution of migrants remains constant over time (Alvarez-Plata et al., 2003; Boeri, Brücker et al., 2001).

Among the studies for Germany, Alvarez-Plata et al. (2003), Boeri and Brücker (2001) and Brücker (2002) apply a stock model with country-specific fixed effects, while Flaig (2001) and Sinn et al. (2001) base their estimates on a stock model which is estimated by pooled OLS. The first studies estimate the annual net inflow at 0.22 per cent of the population from the NMS-8 (160,000 persons p.a.) for Germany, the latter studies forecast the net inflow at 0.64 per cent p.a. (470,000 persons p.a.). The fixed-effects models estimate the long-run migration potential at 1.7 to 1.8 million persons for Germany, and the latter studies at 5.3 million persons. Although the studies employ also different data bases, this difference can be mainly traced back to the use of fixed effects and pooled OLS models (Brücker, 2002; Flaig, 2002). Note that regression diagnostics rejects the pooled OLS specification and that the forecasting error of the pooled OLS model is about twice as high as that of the fixed effects model (see above). In case of the fixed effects models, an extrapolation of the estimate for Germany based on the regional distribution of migrants before enlargement provides an initial net inflow of 0.33 per cent of the population in the NMS-8 p.a. (240,000 persons p.a.), and in case of the pooled OLS model a net inflow of 1.1 per cent p.a. (780,000 persons p.a.). The long-run migration potential is estimated by the fixed effects model at 3.9 per cent of the population in the NMS-8 (2.8 million persons), and in case of the pooled OLS models at 12 per cent (8.8 million persons) p.a.

**Table 2.1 Econometric forecasts of potential migration from the NMS**

| Study | Database | Type of model | Estimator | Initial net inflow | Long-run stock |
|---|---|---|---|---|---|
| ***Estimates of potential immigration into Germany (extrapolations to EU-15 in parentheses)*** | | | | | |
| Alvarez-Plata et al. (2003) | Panel of migration stocks from 18 sending countries, 1967-2001 | Dynamic stock model | Fixed effects | 0.22% (EU-15: 0.33%) | 2.33% (EU-15: 3.82%) |
| Boeri, Brücker et al. (2001), Brücker (2001) | Panel of migration stocks from 18 sending countries, 1967-1998 | Dynamic stock model | Fixed effects | 0.22% (EU-15: 0.34%) | 2.53% (EU-15: 3.89%) |
| Dustmann et al. (2003) | Panel of migration flows from 18 sending countries, 1960-1994 | Static flow model | GMM with individual effects | 0.02% - 0.2% | - |
| Fertig (2001) | Panel of migration flows from 17 sending countries, 1960-1997 | Dynamic flow model | Fixed effects | 0.07% | - |
| Fertig and Schmidt (2001) | Panel of migration flows from 17 sending countries, 1960-1997 | Static error-components model | GMM | 0.01% -0.06% | - |
| Flaig (2001), Sinn et al. (2001) | Panel of migration stocks from 5 sending countries, 1974-1997 | Dynamic stock model | Pooled OLS | 0.64% | 7.2% |
| ***Estimates of potential immigration into the United Kingdom*** | | | | | |
| Dustmann et al. (2003) | Panel of migration flows from 18 sending countries, 1960-1994 | Static flow model | GMM with individual effects | 0.004% - 0.01% | - |
| ***Estimates of potential immigration into the EU-15*** | | | | | |
| Alvarez-Plata et al. (2003) | Panel of labour migration stocks from 20 sending and 15 destination countries, 1993-2001 | Dynamic stock model | GMM-system estimator with individual effects | EU-15: 0.11% - 0.15% (labour force) | EU-15: 2.2% - 2.7% (labour force) |
| Hille and Straubhaar (2001), Straubhaar (2002) | Panel of migration flows from 3 sending and 8 destination countries, 1988-99 | Static flow model (gravity equation) | Pooled OLS | EU-15: 0.27% | - |
| Pytlikova (2007) | Panel of gross and net migration flows from 7 NMS into 15 EU/EEA countries, 1990-2000 | Static and dynamic flow model | Fixed effects | EU/EEA-13: 0.04-0.08% (net), (gross inflows: 0.53-0.57) | EU/EEA-13: 1.5%-1.8% |
| Zaiceva (2006) | Panel of migration flows from 3 sending and 15 receiving countries, 1986-1997. | Static flow model (gravity equation) | Fixed effects | EU-15: 0.23-0.34% | EU-15: 3.5%-5.0% |

Source: Own presentation based on the quoted studies.

The estimates by Fertig (2001) and Fertig and Schmidt (2001) are substantially below the other forecasts: The initial net immigration rate from the NMS to Germany is estimated there at 0.01 to 0.07 per cent p.a., which corresponds to a net immigration of 7,000 to 50,000 persons p.a. from the NMS. The Fertig and Schmidt (2001) study applies an error-component model which considers country- and time-specific fixed effects, but not any other explanatory variables such as wage differences or (un-)employment rates. As a consequence, the forecast refers to the sample average, or, more precisely, to a range of one standard deviation plus/minus the sample average. It is possible that this has resulted in an underestimation of the migration potential from the NMS, since the income of most sending countries in their sample is well above that of the NMS.

The Dustmann et al. (2003) study estimates a flow model with GMM for Germany and the UK, which considers also individual effects. Again, this model provides lower estimates compared to the standard fixed effects models, although the upper range of the estimate for Germany is getting close to the estimates by Alvarez-Plata et al. (2003) and Boeri and Brücker (2001). The findings for the UK refer to flow data from the Passenger Survey and provide, at a share of 0.004 to 0.01 per cent, a very low estimate for the UK. Note that the Dustmann et al. (2003) study - as all other studies - does not consider any possible diversion effects which may explain the later migration surge in the UK.

The gravity-type estimates for the EU-15 of Alvarez-Plata et al. (2003) and Hille and Straubhaar (2001) obtain relatively similar results. Note that the Alvarez-Plata et al. (2003) projection refers to the labour force and not to the population form the NMS, while the estimates by Hille and Straubhaar (2001) use population data. Since the labour force is about 60 per cent of the foreign population from the NMS, the forecasted figures are remarkably similar. Moreover, the aggregate figures from the EU-level estimates are consistent with the extrapolations from the German estimates by Alvarez-Plata et al. (2003) and Boeri and Brücker (2001).

Altogether, at the level of the EU-15, the estimates of these studies are by and large consistent with the migration development from the NMS-8 since enlargement: The actual growth in the number of foreign residents numbered about 250,000 persons p.a. on average since enlargement, which corresponds to 0.34 per cent of the population in the NMS-8. This is consistent with the projections of the Alvarez-Plata et al. (2003), Boeri and Brücker (2001), Hille and Straubhaar (2001) and Zaiceva (2005) studies, while the Flaig (2002) and Sinn et al. (2001) study provided higher, and Fertig (2001), Fertig and Schmidt (2002) and Dustmann et al. (2003) lower estimates.

While the aggregate estimates of potential migration from the NMS-8 to the EU-15 are in many studies consistent with the scale of migration after EU enlargement, the regional structure deviates largely from the estimates. As has been shown above, the regional migration patterns have dramatically changed in the course of EU enlargement. Hence, those studies which have extrapolated the regional distribution of migrants before enlargement tend to overstate the inflows to Austria and Germany and to understate the migration to Ireland and the UK. The same holds true for studies which base their estimates for the UK on past migration flows. Actual migration inflows into the UK have been at about 160,000 p.a. larger than the net flows predicted in the Dustmann et al. (2003) study for the UK (4,000-13,000). Similarly, Boeri and Brücker (2001) and Alvarez-Plata et al. (2001) provided projections based on the extrapolation of the German forecasts which have been substantially below the actual inflows into UK and Ireland after enlargement. In contrast, the flows to the Scandinavian countries have been at or below the predicted levels.

Since a counterfactual situation with a free movement of workers does not exist for the NMS, it is hardly possible to disentangle the causes for the diversion of the migration flows from the NMS after EU enlargement empirically. Obviously, the selective application of the transitional arrangements is one if not the major cause of the diversion process. All studies in the literature rely, however, explicitly or implicitly on the counterfactual assumption that all EU countries will open their labour markets at the same time for migrants from the NMS. The selective application of transitional arrangements will, however, trigger additional inflows to countries which will open their labour markets and less inflows to countries which do not, as Alvarez-Plata et al. (2003) have emphasised in their study before EU enlargement.

The selective application of the transitional arrangements can, however, not explain why Sweden and other Scandinavian countries received only moderate inflows from the NMS-8, while Ireland and the UK absorbed the overwhelming share. Other causes which may have influenced the regional allocation of migration flows from the NMS after EU enlargement are the English language, together with flexible labour market institutions. Moreover, the economic down-turn in Germany has certainly contributed to the diversion towards more prosperous destinations. It might also be possible that the pre-enlargement allocation of migrants from the NMS across the EU-15 was biased by the selective application of immigration restrictions, i.e. the relatively liberal immigration conditions in Austria and Germany compared to other destinations. Finally, the erosion of variable transport costs caused by low-budget air transport makes geographical migration patterns less stable than in previous migration episodes. As a consequence, it was relatively cheap for migrants from the NMS to switch from Austria and Germany to Ireland and the UK and to establish new migration networks there.

These arguments highlight a deeper methodological problem of forecasting migration in the context of EU enlargement in the previous literature: All these models rely explicitly or implicitly on the assumption of the irrelevance of independent alternatives, i.e. that the economic and institutional conditions in alternative destinations do not matter for the scale of migration towards a specific destination. However, the fact that main destinations such as Germany and Austria have maintained their immigration restrictions when the UK and Ireland have opened their labour markets has certainly triggered additional immigration flows to the latter destinations. Similarly, changing economic or social conditions in one destination may also affect the scale of migration in other destinations. The impact of third countries is particularly relevant in the context of the EU Eastern enlargement, since the institutional conditions for immigration have changed dramatically in some destinations but not in other. This is of course hardly possible to identify in advance, since similar evidence from previous migration episodes did not exist in the EU.

# 3 Outline of the theoretical background and the estimation method

## 3.1 Theoretical background

All econometric models in the literature attempting to forecast migration flows or stocks are macro models, which are explicitly or implicitly derived from the aggregation of individual decisions. Most of these models explain migration stocks or flows by wage differences between the destination and the sending country, labour market variables which should capture employment opportunities in the respective locations, and by a set of institutional and distance variables which should approximate migration costs and legal or administrative barriers to migration. These specifications of the migration function have a long tradition in the literature, which can be summarised under the umbrella of the 'human capital approach' (Sjaastad, 1962).[4] The choice of economic variables is primarily based on the classical theoretical contributions by Ravenstein (1889), Hicks (1932), Sjaastad (1962), Todaro (1969) and Harris and Todaro (1970). The first contributions suggest that the net present value of the difference in wages and other sources of income between the host and the source countries could be regarded as a primary determinant of the migration decision, while the latter two papers introduce the role of labour markets in the decision-making process.

More specifically, the standard model in the literature is derived from the following assumptions: The utility of individuals is *inter alia* determined by expectations of income levels in the respective locations. Utility is concave in the income differential. Explicitly or implicitly, most models of the migration decision assume that other arguments enter the utility function as well. In particular, non-monetary factors such as the disutility from leaving a familiar social and cultural environment and the role of family ties (Mincer, 1978) are considered.[5] Depending on the assumptions on the utility function, the functional form of the macro-migration function is specified both in semi-log form (e.g. Hatton, 1995) and in double-log form (e.g. Faini/Venturini, 1995).

Expectations on income levels are conditioned by employment opportunities, such that the expected income levels depend on the probability of employment in the respective location (Todaro, 1969; Harris/Todaro, 1970). Moreover, since employment opportunities of migrants in host countries are below those from natives, some models predict that the coefficient for the employment rate in the host country is larger than that in the source country (Hatton, 1995).

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4 More precisley, migration is understood as an "investment in the productive use of human resources" (Sjaastad, 1962) by these migration theories.

5 See Faini and Venturini (1995) for a model which considers non-pecuniary arguments explicitly in the utility function.

If capital markets are not perfect, liquidity constraints affect migration decisions. Consequently, for a given income difference between the host and the source country, the income level in the source country has a positive impact on migration (see Faini/Venturini, 1995, for a formal exposition, and Hatton and Williamson, 2002, as well as Pederson et al., 2004, for contrasting evidence).

Migration networks alleviate the costs of adapting to an unfamiliar environment, such that the costs from migration are expected to decline with the stock of migrants already existing in the destination country (Massey et al., 1984; Massey/Espana, 1987). Distance serves as a proxy for pecuniary and non-pecuniary migration costs, which are expected to increase with the spatial distance between the source and the destination country (see Schwarz, 1962, for a detailed discussion of the role of distance). The time trend is included as a proxy for the variation in the costs of migration, which are expected to fall over time in the course of decreasing transport and communication costs.

Among the institutional variables, most models consider dummy variables for conditions which facilitate immigration (e.g. bilateral guestworker recruitment agreements, free movement of workers within the EU) or hinder emigration (e.g. the iron curtain in the former COMECON countries). Moreover, some models include certain variables for push and pull factors in sending and receiving countries such as dummy variables for dictatorship, the Freedom House political and civil right indices etc.

*Risk and uncertainty*

Some models in the literature explicitly consider the risk aversion of individuals. E.g. Banerjee and Kanbur (1986) have developed a model which assumes that individuals are risk-averse. They consider in a specification of a regional migration function the variance in expected income levels. The higher the variance, the lower the migration rate if individuals are risk adverse. This is, however, seldom applied in the context of international migration since time-series data on the distribution of income do not exist in most countries.

The impact of uncertainty on the migration decision under the assumption of fixed migration costs has been analysed theoretically in an option-value framework by Burda (1995). The model treats migration as an irreversible investment, such that the option value of waiting is increasing in the uncertainty about the net returns to migration. Hatton (1995) derives an error-correction specification of the migration function from these assumptions, without changing the contents of the long-run migration function of the standard migration models. Moreover, Hatton (1995) assumes that individuals are risk-averse, but that uncertainty focuses on employment opportunities. As a consequence, the model expects that the coefficient for the employment variable in the destination country is larger than that for the income variables.

*Limitations of the human capital approach*

Altogether, the human capital theories of migration expect that the wage difference between the host and the home country and the employment rate in the host country have a positive impact on migration, while the employment rate in the host country has a negative impact. At a given wage difference between the host and the home country, the income level in the home country is expected to have a positive impact, since it relaxes liquidity constraints. Finally, the scale of migration is expected to decline with geographical distance, since this variable approximates fixed and variables migration costs.

There exist numerous microeconomic models of the migration decision in the literature which go far beyond these considerations. *Inter alia*, these models analyse the role of portfolio diversification of families in the absence of perfect capital markets (Stark, 1991) and the role of relative deprivation (Stark, 1984). However, few of these theoretical contributions have developed macro migration functions which can be applied empirically. Moreover, the estimation of more complex macro models is hindered by data limitations, e.g. time series information on the income distribution in the receiving and sending countries is rarely available for longer time spans.

*Migration flows versus migration stocks*

Thus, although the microeconomic migration literature is richer than the standard macro migration model suggests, a consensus has evolved in the literature to explain migration by income variables, labour market variables such as (un-)employment rates, distance, and institutional variables. One important difference in the specification of macro migration functions in the literature refers to the choice of the dependent variable. While the larger part of the literature employs net or gross migration *flows* on the left-hand side of the macro migration equation (e.g. Faini/Venturini, 1995; Hatton, 1995; Hille/Straubhaar, 2001; Pederson *et al*., 2004; Pytlikova, 2007), a minority of the studies chooses the migration *stock* (i.e. the number of residents) as the dependent variable (e.g. Boeri/Brücker, 2001; Brücker/Schröder, 2006; Flaig, 2001; Sinn et al., 2001).

The difference between these two specifications can be traced back to the underlying assumptions regarding the aggregation of individual migration decisions: The flow model is implicitly based on the assumption of a representative agent, i.e. that the behaviour of individuals is homogeneous. In contrast, the stock model is based on the assumption that individuals differ with regard to their preferences or human capital characteristics, which in turn determine the benefits and costs of migration. The specific form of the macro migration function depends then on the assumptions which are made regarding the distribution of preferences or human capital characteristics. For a formal derivation of a stock model which considers heterogeneous preferences see Brücker/Schröder (2006).

The specification of the migration function in flow or stock form has important implications for migration forecasts: In case of the flow-specification of the migration function, net migration flows do not cease before (expected) income levels between the host and the source country have converged to a certain threshold level which captures the uniform level of migration costs. In contrast, in case of the stock model, net migration ceases when the benefits from migration equals the costs for the *marginal* migrant. Consequently, net migration flows converge to zero when the migration stock approaches its equilibrium level.

This might be an explanation for the phenomenon that in case of the Southern enlargement of the EU, where still substantial income differences between the incumbent and the new member states from Southern Europe existed, net migration flows have stagnated or even declined after the application of the rules for the free movement of workers. Note that most receiving countries have built up substantial migration stocks from the later EU members from Southern Europe already in the 1960s and 1970s.

*Permanent vs. temporary migration models*

The overwhelming share of migration is temporary, i.e. migrants return to their home country before the end of their lifetime. Moreover, many individuals have several migration episodes during their lifetime, a phenomenon called 'replicated migration' in the literature. Nevertheless, most macro migration models in the literature treat migration as permanent. There exist, however, many theoretical models in the literature which consider temporary migration (e.g. Djajic/Milbourne, 1986). There, the length of an individual migration episode is explained by expected earnings in the home and the destination countries and the costs of staying in a foreign country which are determined by individual preferences. Brücker and Schröder (2006) have derived the consequences of temporary migration for migration stocks and flows in temporary migration framework with heterogeneous agents. The length of individual migration episodes varies depending on the expected difference in earnings and individual preferences. The equilibrium stock of migrants increases with the difference in earnings for a given distribution of individual preferences. Analogously, the gross emigration and return migration rates are increasing in the earnings difference, while the net migration ceases to zero if the equilibrium is achieved and the rates of population growth in the foreign and the home country are equal. Thus, the stock model is consistent with a temporary migration framework.

*Bilateral versus multi-country models*

Theoretically, most models in the literature are two-country or two-region models, i.e. migrants decide whether to migrate into a foreign country (region) or to stay at home. This simplifies the modelling effort tremendously. However, migration decisions are in fact optimising decisions across space, i.e. (potential) migrants compare the net difference in utility between all possible locations including the home country or region. In empirical applications this is usually ignored, i.e. it is explicitly or implicitly assumed that migration between two countries or regions is driven by the differences in expected income and other factors between these two regions, but not by the immigration conditions in third countries. Technically, this assumption is called 'Irrelevance of Independent Alternatives' (IIA). All gravity models and other macro migration models applied in the empirical literature rely on this assumption. If this assumption is not valid, the estimated coefficients are biased. While the IIA assumption might be not too demanding if we consider migration towards destinations which differ largely in their characteristics and/or geographical distance, it is particularly dangerous in the context of migration in the enlarged EU, since many destinations are similar with respect to their income levels, culture and other factors. In this case it is likely that institutional factors such as the selective application of the transitional arrangements for the free movement of workers have an impact on migration movements, such that conditions in third countries matter. However, explaining bilateral migration movements by the entire set of possible migration alternatives is not a viable estimation strategy, such that simpler tools have to be applied to circumvent the problem (see below).

### 3.2 The macro migration equation

Following the overwhelming majority, we apply here a parsimonious specification of the macro migration function in our econometric model. The theoretical approach follows the temporary migration framework with heterogeneous agents originally developed by Brücker and Schröder (2006). Individuals have the choice to stay at home or to move for a certain period of their life time (or their entire life) to another country. They choose the length of the stay in the foreign country such that they maximise utility over their life time. The utility of individuals depends on their income in the respective locations, but also on non-monetary factors such as social relations, cultural links etc. At a given difference in the net present value of earnings, the time spend abroad depends on the weight individuals assign to monetary earnings and to the non-pecuniary factors relevant for their utility in the respective locations (see Djajic and Milbourne, 1986; Dustmann and Kirchkamp, 2002; for similar models). Under the assumption that these preferences are not uniform across individuals, an equilibrium relationship between migration stocks and the difference in income levels between the host and the home country emerges. At this equilibrium, the gross emigration rate and the gross return migration rate are equal, such that net migration ceases (Brücker and Schröder, 2006).

More specifically, the long-run macro migration function is specified in the following form:

$$mst^*_{fit} = a_0 + a_1 \ln\left(\frac{w_{ft}}{w_{it}}\right) + a_2 \ln\left(e_{ft}\right) + a_3 \ln\left(e_{it}\right) + \varepsilon_{fit}\ , \tag{1}$$

where $mst_{fit}^*$ denotes the long-run or equilibrium share of migrants residing in destination $f$ in the population from sending country $i$, $w_{ft}$ and $w_{it}$ the wage rate in the destination and the sending country, and $e_{ft}$ and $e_{jt}$ the employment rate in the respective countries and $\varepsilon_{fit}$ the disturbance term. The subscript $f$ denotes the destination, $i$ the index of sending countries and $t$ the time index.

The variables of the model are derived from the standard human capital model, i.e. the utility is determined by expectations on income levels, which are in turn conditioned by employment opportunities. Individuals are risk averse, but uncertainty focuses on employment opportunities. Hence, it is expected that the coefficient for the employment rate in the receiving country is larger than the coefficient for the employment rate in the home country (Hatton, 1995).

The dynamics of the model are specified here in form of a simple partial adjustment mechanism, i.e. as

$$mst_{fit} = b_0 + b_1 \ln\left(\frac{w_{ft}}{w_{it}}\right) + b_2 \ln\left(e_{ft}\right) + b_3 \ln\left(e_{it}\right) + b_4\, mst_{fi,t-1} + \nu_{fit}\,, \qquad (2)$$

where the coefficient $b_4 < 1$ captures the dynamic adjustment of the model. The restriction that $b_4 < 1$ is needed for the dynamic stability of the model. Note that this does not rule out that networks of previous migrants alleviate migration costs and facilitate further migration. In contrast, we follow here the literature that migration networks or migration chains reduce migration costs (Bauer et al., 2002a; 2002b; Massey et al., 1984; Massey and Espana, 1987). However, since the preference for amenities in the home country tends to increase for the marginal individual the higher the share of the population is that already lives abroad, the declining costs for migration resulting from networks are eventually offset by the low preferences to move abroad of the remaining population.

Of course, the specific functional form of the model depends on the underlying assumptions regarding the utility function. The model may thus be specified both in double-log or semi-log form (see e.g. Hatton, 1995, for a discussion).[6]

### 3.3 Identifying the impact of EU-Eastern enlargement

So far we have ignored all institutional restrictions and applied the traditional irrelevance of independent alternatives (IIA) assumption. Since institutional conditions in alternative destinations have turned out to be quite relevant as the diversion of migration flows away from Germany and Austria towards the UK and Ireland has demonstrated, we employ here another approach than in the previous literature. Instead of estimating the model in equation (2) for bilateral country pairs, we estimate the migration from a number of destinations into the entire EU-15 assuming that the choice to move into the EU-15 is independent from other possible destinations. Since the overwhelming share of the migrants from the NMS and the other countries included in the sample moves to the EU-15, ignoring other destinations does not seem to be too restrictive. By treating the EU as a single destination country, we circumvent the IIA problem and should obtain consistent estimates of the parameters as long as other alternative destinations outside the EU do not affect the scale of migration into the EU-15 and as long the EU-15 countries are relatively homogeneous in their characteristics such that a change in the

[6] The semi-log form employed here provides a better forecasting performance than a double-log specification. See Brücker/Siliverstovs (2006).

regional structure of migration within the EU does not largely affect overall migration into the EU-15.

Although income levels and employment opportunities across the individual EU countries are relatively homogeneous, there still exist some differences which might be hidden if we average all variables of the model across the destination countries in the EU-15. We have therefore weighted all earnings and employment variables by the share of the respective country in the migrants from a specific sending country in the EU-15 in order to capture the relevant values for the explanatory variables. We expect that this increases the explanatory power of the model.[7]

The second problem is the identification of the impact of the remaining immigration restrictions. Since a free movement counterfactual does not exist for the NMS, we decided to include in our sample three groups of sending countries: The member states from the EU-15, for which the free movement of workers was granted for the entire or a part of the sample period, the NMS-8, for which the transitional arrangements apply since 2004, and the NMS-2, for which no transitional arrangements apply during the sample period, but bilateral agreements which have facilitated migration. We assume that immigration restrictions affect both the absolute terms *and* the slope parameters of the model.

In general form we can then write the migration function under consideration of the immigration restrictions as

$$mst_{fit} = \sum_j \alpha_j x_{jft} + \sum_k \beta_k x_{kit} + \sum_n \gamma_n z_{nfit} + \sum_n \sum_j \eta_{nj} z_{nfit} x_{jft} + \sum_n \sum_k \lambda_{nk} z_{nfit} x_{kit} + \delta\, mst_{fi,t-1} + \nu_{fit} \quad (3)$$

where $z$ denotes a dummy variable which captures an institutional regime which affects the migration opportunities and costs, $x$ an explanatory variable such as the wage and the employment rate which affects migration incentives, $\alpha, \beta, \gamma, \eta, \lambda$ and $\delta$ coefficients, $j$ an index for variables which capture economic conditions in destination $f$, $k$ an index for variables which capture economic conditions in sending country $i$, $n$ an index for an institutional regime which affects migration between destination country $f$ and sending country $i$, and $\nu$ the error term.

Thus, different institutional regimes can affect migration in our model via the absolute terms and via the slope parameters for the economic variables considered by the model. Under the assumption that the slope parameters are uniform across countries for a given institutional regime, we can use the estimated parameters of the model to identify how a change in the institutional regime affects migration. As an example, if the NMS respond similarly as other EU member states under free movement to the explanatory variables such as the income differential and the employment rate, we can use the estimated

[7] The migration shares are of course endogenous which may bias the results. We have therefore used both the average values of the variables in the EU-15 and lagged values of the explanatory variables as instruments which did not change the results significantly.

parameters of the free movement dummy and the interaction dummies of the free movement with the explanatory variables for identifying the impact of a switch of an institutional regime which is characterised by transitional arrangements to free movement. However, it is worthwhile noting that countries might be heterogeneous, i.e. that the migration behaviour of the NMS may differ in one way or another from that of the EU-15 member states. The assumption of homogenous slope parameters is, however, needed for the identification of the effects of different institutional conditions.

In the specification of the model we consider the following institutional regimes:

- transitional arrangements for the NMS-8 between 2004 and 2007 and for the NMS-2 in 2007;
- bilateral (guestworker) agreements between individual EU-15 and the NMS-2 which were in place since the end of the 1990s;
- restricted immigration, which holds for third countries such as Turkey, Morocco and Tunisia as well as for the NMS before the transitional arrangements or the bilateral agreements were in place;
- emigration restrictions which were in place for citizens from most NMS under the so-called 'iron curtain'.

For each regime we created a dummy variable, which was included as a level variable and as an interaction variable with all other explanatory variables of the model.

### 3.4 Other estimation issues

The error term is specified here as one-way error component model, i.e. as

$$v_{it} = \mu_i + \varepsilon_{it}, \qquad (4)$$

where $\mu_i$ is a country specific fixed effect which captures all time-invariant variables such as geographical distance, language, and cultural proximity migration decisions, and $\varepsilon_{it}$ is white noise.

The specification of the error term has important implications for the scale of migration forecasts. In the literature, most macro migration models are either estimated by pooled ordinary least squares (pooled OLS) or with a fixed effects estimator. While the first approach assumes that the intercept term (constant) is uniform for all countries, the latter approach allows the intercept term to differ across countries. However, both estimators impose the restriction of uniform slope parameters. In the case of Germany, The pooled OLS estimator has provided much larger migration forecasts (Flaig, 2001; Sinn et al., 2001) compared to the fixed effects estimator (Alvarez-Plata et al., 2003; Boeri/Brücker, 2001; Brücker, 2001).

The intercept term captures all time-invariant country specific effects such as geographical factors, culture, historical links, language etc. Most of these variables are unobservable and can therefore not be explicitly considered in pooled OLS models. Imposing the restriction of a uniform intercept term can therefore produce inconsistent and potentially misleading estimates of the parameter values unless the constants are identical across countries (Baltagi, 1995). In the context of migration regressions, the regression diagnostics unambiguously rejects the pooled OLS specification when compared to the fixed effects model (see e.g. Alecke et al., 2001; Alvarez-Plata et al., 2003; Brücker, 2001; Fertig, 2001; Pytlikova, 2007).

There remain, however, two arguments why pooled OLS models are still used for forecasts from the NMS: Firstly, since most forecasts of potential migration from the NMS do not include data from the NMS in the data base, the estimated fixed effects cannot be used for forecasting migration from the NMS. The NMS are usually not included in the country sample since migration from there has been hindered by the Iron Curtain and later by the immigration restrictions in the EU-15. A widely applied procedure to circumvent this problem is to explain the fixed effects in an auxiliary regression by time-invariant factors (e.g. language, geographical location etc.) (Fertig, 2001; see also Alvarez-Plata et al., 2001; Boeri/Brücker, 2001; Zaiceva, 2006). This allows a consistent estimation of the slope parameters, even if the fixed effects are not entirely explained. Note that about 90 per cent in the variance of the fixed effects has been explained in auxiliary regressions (see Alvarez-Plata et al., 2003).

Secondly, it is sometimes argued that the within transformation by the fixed effects estimator reduces the variance of the data such that the coefficients cannot be properly identified (Flaig, 2001). However, note that the variance of income levels and unemployment rates is pretty large over time if we consider that many models base their estimates on data bases which cover between three and four decades. Not surprisingly, a detailed analysis of the forecasting performance of different estimators finds that the out-of-sample forecasting error of pooled OLS models is about twice as high as that of fixed effects models (Alvarez-Plata et al., 2003; Brücker/Siliverstovs, 2006a; 2006b).

Another alternative would be to specify the individual term in form of a random effects model. This is rarely applied in the macro migration literature, since it is rather unlikely that individual effects follow a random distribution in cross-country regressions. Indeed, the standard Hausman-test clearly rejects the random effects specification in the context of macro migration models. The forecasting error of the random effects model is moreover clearly larger than that of fixed effects models (Brücker/Siliverstovs, 2006a; 2006b).

The different migration behaviours across countries can affect not only the intercept term, but also the slope parameters of the model. The homogeneity assumption of standard panel models can therefore yield inconsistent and biased estimates of the parameters (Pesaran and Smith, 1995).

Several alternatives to the restriction of uniform slope parameters can be considered. The regressions can be estimated individually, after which the means of the estimated coefficients can be calculated. This 'Mean Group' estimator produces consistent results if the group dimension of the panel tends to infinity (Pesaran and Smith, 1995) – which is, however, not the case in the samples at hand for migration forecasts. Another alternative is the 'Pooled Mean Group' estimator, which constrains the long-term coefficients to be the same but allows for heterogeneous short-run coefficients. This estimator is an intermediate case – it imposes fewer restrictions on the adjustment process, but the same restrictions on the long-term coefficients as standard panel models. In case of a cointegration relationship between the variables, similar assumptions on the convergence of the estimated parameters to their true values as in the individual case apply (Pesaran et al., 1997).

Although the theoretical arguments against the homogeneity assumption of pooled estimators are appealing, there exists evidence in many other empirical contexts that the forecasting performance of traditional panel estimators such as the fixed effects estimator is superior relative to estimators with heterogeneous slope parameters (Baltagi et al., 2002; Baltagi et al., 2000; Baltagi and Griffin, 1997). The reason for this finding is that individual regressions can yield highly unstable results if data sets have a limited time-dimension.

Brücker and Siliverstovs (2006a, 2006b) and Helmert (2007) have tested in the migration context *inter alia* the forecasting performance of the Pooled Mean Group (PMG), the Mean Group (MG) estimator and individual OLS (IOLS) regressions for each country. They find that the forecasting error of the PMG and the MG is much higher than that of homogeneous estimators such as the fixed effects and the pooled OLS estimators, which confirms the findings by Baltagi et al. (2002). However, the forecasting performance of the individual OLS regressions depends on the forecasting criteria: The forecasting performance is poorer compared to the homogeneous panel estimators if we use the Root Mean Squared Error as the criterion, which measures the mean forecasting error from all countries in absolute terms. However, if we apply the Root Mean Squared Percentage Error, which measures the mean percentage error of the forecasts for all countries, the individual OLS estimator outperforms the homogeneous panel estimators. Thus, the panel estimators are more appropriate if we are interested in the number of migrants which move from all NMS into the EU-15 (or an individual EU-15 country), while the individual OLS regressions are more useful if we are interested in the percentage of migrants which leave each individual NMS country (Helmert, 2007).

Thus, most empirical models are based on a dynamic specification of the migration function and employ country-specific fixed effects. It is well known that these types of models may cause a simultaneous equation bias if the time dimension of the data at hand is limited (Nickell, 1981; Kiviet 1995). Although the simultaneous equation bias disappears with the time dimension of the panel, it can still be relevant for the size of a panel with between 15 and 35 observations over time as is usually employed in the migration literature (Judson and Owen, 1999).

Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998) have developed Generalized Methods of Moments (GMM) estimators, which difference the data and use either first-differences or first-differences and lags of the level variables as instruments. This allows a consistent estimation of dynamic models with fixed effects. However, the gains from an unbiased estimation by GMM might be offset by losses in efficiency if the group dimension of the data set is limited (Baltagi et. al., 2000). Brücker and Siliverstovs (2006a; 2006b) show that the forecasting performance of the GMM estimators is poor compared to standard fixed effects and other panel models.

To sum up, against the background of the experience in the literature, we employ a standard fixed effects estimation approach here.

# 4 Data

Our sample consists of 28 sending countries during the period 1982 to 2007: The 'old' EU member states with the exception of Luxembourg (14), the NMS-8, the NMS-2 (Bulgaria and Romania), the (former) Yugoslavia, Morocco, Tunisia, and Turkey. This sample thus covers - with the exception of the Commonwealth of Independent States (CIS) countries - the entire European continent and some main sending countries at the European periphery. Moreover, the EU-15 is the main destination for migrants from these countries such that the assumption of the irrelevance of independent alternatives is not too demanding. For this reason we have excluded the CIS countries from the sample, since ethnic disentangling plays an important role there. Other destinations such as Russia are therefore important alternatives to the EU-15 in case of the CIS. Altogether, our sample covers more than 80 per cent of the immigrants residing in the EU-15. Due to data limitations, the sample is not balanced. Note that we can include only those sending countries for which (almost) the entire EU-15 report migration stocks.

The data on migration stocks are derived from the statistics of the EU-15 destination countries. Whenever possible, we have used the national population statistics, and the Eurostat Labour Force Survey in the remaining cases. However, in order to avoid structural breaks we rely only on one data source for a given destination. These data have then been aggregated to calculate the number of migrants in the EU-15. Since national data sources and nationality concepts differ across the EU, some measurement error is unavoidable.

As an approximation for average earnings we have used the GDP per capita. We employed in our regressions both the GDP per capita at purchasing power parities and at current exchange rates. Since the forecasting performance of the income variable at current exchange rates has turned out to be better as the income measured at purchasing power parities, we decided to use the GDP per capita at current exchange rates in the regressions presented here. Note that particularly in the case of temporary migration the GDP at current exchange rates affects migration decisions, since a part of the income is consumed in home countries. Moreover, the measurement error for the GDP per capita at current exchange rates is likely to be smaller compared to the purchasing power parity estimates. The GDP per capita at current exchange rates has been taken from the World Development Indicators (World Bank, 2008), while the GDP per capita at purchasing power parity has been derived from the series provided by

Angus Maddison and the University of Groningen, which has been extrapolated from the Wold Bank series. For the calculation of the employment rates we used the standardised unemployment rates (ILO norm) provided by Eurostat which have been complemented by national statistical sources in some cases. The population figures have been taken from Eurostat. The destination country variables (i.e. the EU-15 variables) have been calculated by weighting the variables across the destinations with the immigrant shares as outlined above.

The institutional variables are defined as follows: $TRANS_{it}$ is a dummy variable which has a value of 1 if the transitional arrangements for the free movement of workers between the EU-15 and the NMS-8 are in place and of zero otherwise; $GUEST_{it}$ is a dummy variable which has a values of 1 if migration from Bulgaria and Romania is facilitated by bilateral guestworker agreements and of zero otherwise;[8] $RESTRICT_{it}$ is a dummy variable which has a value of 1 if the country does not participate in the free movement of the EU and the EEA and if immigration is not facilitated either by transitional arrangements for the free movement or by guestworker agreements; $IRON_{it}$ is a dummy variable which has a value of 1 if emigration is effectively hindered by the iron curtain and of zero otherwise.

Several aspects are important to notice in this context. The institutional variables considered here are of course only rough approximations of the institutional conditions in the EU-15. As an example, we are not able to capture changes in the application of the transitional arrangements during the 2004-2007 period in individual EU member states, i.e. countries which have decided to open their labour markets during the sample period. This would require including a dummy variable and the respective interaction dummy variables for each year since 2004, which would in turn make any identification impossible. A similar argument applies for changes of immigration policies of the EU-15 vis-à-vis Bulgaria and Romania during the phase which we characterise here as influenced by bilateral migration agreements. However, in our view these changes in the immigration policies during the 2004-2007 period did not affect migration flows from the NMS-8 and the NMS-2 much, such that our identification strategy captures the main changes in the immigration regimes of the EU-15 during the sample period. A more detailed consideration of the institutional regimes would require estimating the model as a panel of destination and sending countries, which would in turn run into the difficulties of employing the irrelevance of independent alternatives assumption. This would yield extremely biased results if migration in one EU-15 country is affected in one way or another by the immigration policies of other EU-15 countries, which is certainly the case in the context of the EU's Eastern enlargement in our view.

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[8] This holds for Bulgaria and Romania in the years from 1998 until the end of the sample period. The traditional source countries of guestworker recruitment in the EU such as Spain, Portugal, and Turkey have not been subject of those agreements during the sample period. We did not include a transitional arrangement dummy for the one observation in 2007, since (i) the immigration conditions did not change in the EU-15 for Bulgaria and Romania after 2007 with the exception of Sweden and Finland which are no main destinations for the NMS-2, and (ii) one year is not sufficient to identify this variable properly,

A detailed description of the data set and the descriptive statistics is available from the authors upon request.

## 5 Estimation results

The estimation results are displayed in Table 5.1. We have estimated four specifications of the model here. First, we estimated a simple fixed effects model which considers the income difference between the EU-15 and the sending country and the immigration restrictions – including the interaction terms between the immigration restrictions and the income differential – only. Second, we employed a fixed effects model which considers in addition the employment rates in the EU-15 and the sending countries. As can be seen in the regression diagnostics, the explanatory power of the second model is higher and the forecasting error substantially lower. The forecasting error has been calculated for the ten NMS for the years 2001 to 2007 by using the root mean squared error (RMSE) and the root mean squared percentage error (RMSPE) as forecasting criteria. Third, we estimated this model also with Feasible GLS and cross-sectional weights allowing for heteroscedasticity in the disturbances. Testing this model against the second specification suggests that heteroscedasticity is present. Moreover, the predictive power of the model is higher compared to the second model. Finally, we estimated the same model allowing furthermore for serial correlation in the error terms since our specification tests suggest that the disturbances are indeed serially correlated. The forecasting error declines however only marginally in this specification compared to the third one. The last model is our preferred specification which we use for the calculation of the forecasts.[9]

[9] The specification tests are available from the authors upon request.

**Table 5.1 Estimation results**

| | Model (1) | | Model (2) | | Model (3) | | Model (4) | |
|---|---|---|---|---|---|---|---|---|
| | coefficient | *t*-statistics | coefficient | *t*-statistics | coefficient | *t*-statistics | coefficient | *t*-statistics |
| $\ln(mst_{i,t-1})$ | 0.963 *** | 48.92 | 0.957 *** | 44.12 | 0.958 *** | 50.7 | 0.960 *** | 51.12 |
| $\ln(y_{eu,t-1}/y_{i,t-1})$ | 0.002 * | 1.64 | 0.002 * | 1.71 | 0.003 *** | 2.63 | 0.003 *** | 2.67 |
| $\ln(e_{eu,t-1})$ | | | 0.014 | 1.17 | 0.012 | 1.19 | 0.011 | 1.17 |
| $\ln(e_{i,t-1})$ | | | -0.004 | -0.56 | -0.005 | -0.84 | -0.005 | -0.83 |
| $TRANS_{it} \times \ln(y_{eu,t-1}/y_{i,t-1})$ | -0.002 * | -1.65 | 0.001 | 0.28 | 0.001 | 0.46 | 0.001 | 0.47 |
| $TRANS_{it} \times \ln(e_{eu,t-1})$ | | | 0.088 ** | 2.17 | 0.082 ** | 2.51 | 0.082 ** | 2.51 |
| $TRANS_{it} \times \ln(e_{i,t-1})$ | | | -0.020 | -1.21 | -0.016 | -1.26 | -0.016 | -1.25 |
| $GUEST_{it} \times \ln(y_{eu,t-1}/y_{i,t-1})$ | -0.002 | -1.58 | -0.007 * | -1.66 | -0.004 | -0.83 | -0.004 | -0.79 |
| $GUEST_{it} \times \ln(e_{eu,t-1})$ | | | -0.142 | -1.47 | -0.037 | -0.35 | -0.037 | -0.32 |
| $GUEST_{it} \times \ln(e_{i,t-1})$ | | | 0.013 | 0.72 | -0.002 | -0.1 | -0.003 | -0.11 |
| $RESTR_{it} \times \ln(y_{eu,t-1}/y_{i,t-1})$ | -0.004 *** | -3.15 | -0.003 ** | -2.4 | -0.003 *** | -2.95 | -0.003 *** | -3.00 |
| $RESTR_{it} \times \ln(e_{eu,t-1})$ | | | 0.011 | 0.88 | 0.007 | 0.63 | 0.007 | 0.65 |
| $RESTR_{it} \times \ln(e_{i,t-1})$ | | | 0.002 | 0.22 | 0.003 | 0.56 | 0.003 | 0.46 |
| $IRON_{it} \times \ln(y_{eu,t-1}/y_{i,t-1})$ | -0.001 | -0.8 | -0.006 * | -1.94 | -0.002 | -0.68 | -0.002 | -0.63 |
| $IRON_{it} \times \ln(e_{eu,t-1})$ | | | -0.048 | -0.36 | -0.038 | -0.33 | -0.039 | -0.33 |
| $IRON_{it} \times \ln(e_{i,t-1})$ | | | -3.582 | -0.46 | -0.471 | -0.07 | -0.341 | -0.05 |
| $TRANS_{it}$ | 0.001 | 1.12 | 0.003 * | 1.85 | 0.002 * | 1.95 | 0.002 * | 1.89 |
| $GUEST_{it}$ | 0.004 * | 1.85 | 0.004 ** | 2.01 | 0.002 | 1.24 | 0.002 | 1.13 |
| $RESTR_{it}$ | 0.001 | 1.38 | 0.002 * | 1.71 | 0.001 ** | 1.53 | 0.001 ** | 1.5 |
| $IRON_{it}$ | -0.001 | -0.45 | -0.003 * | -1.5 | -0.002 * | -0.97 | -0.002 * | -0.92 |
| $WAR_{it}$ | 0.007 *** | 5.02 | 0.008 *** | 5.03 | 0.006 *** | 3.2 | 0.006 *** | 3.09 |
| obs. | 552 | | 552 | | 529 | | 529 | |
| Wald $\chi(51)^2$ statistics | 64,491 *** | | 65,651 *** | | 107,016 *** | | 109,977 *** | |
| $R^2$ | 0.87 | | 0.88 | | - | | - | |
| RMSE (2001-07) | 0.000185 | | 0.000121 | | 0.000025 | | 0.000023 | |
| RMSPE (2001-07) | 0.480 | | 0.146 | | 0.060 | | 0.057 | |

The dependent variable is $\ln(mst_{it})$. -- ***, **, * denote the significance at the 1-, 5- and 10 per cent level, respectively.-- All models include country dummy variables.-- Model (1) and model (2) are estimated by LSDV. Model (3) is estimated by weighted Feasible GLS using the average GDP per capita in the sending country as a weight.-- Model (4) is estimated by weighted Feasible GLS allowing for panelspecific first-order autocorrelation.

The qualitative results confirm largely our theoretical expectations. The income difference between the EU-15 and the sending countries has in all four specifications the expected positive sign and appears significant. The employment rate in the EU-15 has the expected positive sign, while the employment rates in the sending countries have the expected negative signs, although both variables do not appear as significant.

The interaction dummy variables can only be interpreted together with the signs and the size of the level dummy variables. As a consequence, the impact of the income gap as well as the impact of the employment variables are either reduced or increase with the respective dummy variables. As expected, the civil wars in the former Yugoslavia have exerted a strong positive impact on migration from the affected countries into the EU-15.

# 6 A Projection of migration from the NMS-8 and the NMS-2

The coefficients of model (4) in Table 5.1 are used for the simulation of future migration movements from the NMS into the EU-15. More specifically, we have calculated two scenarios:

- The first scenario assumes that the status quo regarding the institutional conditions continues. This means that (i) the transitional arrangements for the NMS-8 are employed in the same way as during the 2004-2007 period, and (ii) the immigration conditions for Bulgaria and Romania remain the same as under the bilateral agreements which are in place since the end of the 1990s.

- The second scenario assumes that rules of the free movement of workers is introduced in the entire EU, such that the values of all dummy variables and interaction terms which capture the remaining immigration restrictions for the NMS are assumed to be zero.

The results of the scenarios are displayed in Table 6.1 and Table 6.2. As a rule of a thumb, our projections indicate that the present stock of migrants residing in the EU-15 stood in 2007 at one half of the potential which will be realised by the year 2020 if the current migration conditions prevail and at about two-fifth if the free movement is introduced in the entire EU-15. During the same period of time, the net growth of the foreign population from the NMS-8 and the NMS-2 in the EU-15 will have declined from about 430,000 persons p.a. to 200,000 persons p.a. under the current institutional conditions and from 515,000 persons p.a. to 235,000 persons p.a. under free movement.

More specifically, the model predicts that the stock of migrants from the NMS-8 could increase from about 1.9 million in 2007 to 3.8 million in 2020 if the present restrictions are maintained, while it could increase to 4.4 million under free movement in the same period of time. This corresponds to 5.2 per cent of population of the sending countries (1.0 per cent of the population of the EU-15) under the current immigration conditions and to 6.1 per cent of the population of the sending countries (1.13 per cent of the population of the EU-15) under free movement. Thus, our scenario predicts that removing the immigration restrictions in important destinations such as Germany and Austria would trigger an additional migration of about 600,000 persons in the long-run if migrants from the NMS-8 behave in the same way as other migrants from the EU-15. However, the model does not make any predication on the allocation of migrants across different destinations in the EU-15.

Concerning migrants from Bulgaria and Romania, their stock could increase from about 1.8 million persons in 2007 to 3.9 million in 2020 under the present immigration restrictions, while it could increase to 4.0 million when the free movement is introduced. This corresponds to 13.4 per cent of the population of the sending countries (1.0 per cent of the population of the EU-15) under the current institutional conditions, and to almost 14 per cent of the population of the sending countries (1.1 per cent of the population of the EU-15) when the free movement is introduced. Note again that the free movement scenario is derived from the assumption that migrants from Bulgaria and Romania behave in the same way as other EU-15 migrants. Given that income levels in Bulgaria and Romania deviate substantially from the sample mean, the forecasts for these two countries are less reliable than those for the NMS. Thus, actual migration figures under free movement may deviate from the scenario presented here and the actual difference between the restricted and the free movement scenario might be larger.

**Table 6.1 Projection of migration stocks, 2007-2020[10]**

| | CZ | EE | HU | LT | LV | PL | SK | SI | BG | RO | NMS-8 | NMS-2 | NMS-10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *forecast under status quo conditions (nationals residing in the EU-15 in persons)* | | | | | | | | | | | | | |
| 2006 | 79,094 | 32,020 | 106,618 | 102,455 | 40,826 | 1,039,283 | 109,336 | 30,265 | 246,187 | 1,045,873 | 1,539,898 | 1,292,060 | 2,831,958 |
| 2007 | 105,918 | 33,998 | 119,465 | 111,631 | 46,554 | 1,280,756 | 120,728 | 32,347 | 272,521 | 1,550,240 | 1,851,395 | 1,822,761 | 3,674,157 |
| 2008 | 119,002 | 36,861 | 136,072 | 127,552 | 55,159 | 1,437,604 | 146,399 | 30,036 | 293,502 | 1,722,887 | 2,088,685 | 2,016,389 | 4,105,074 |
| 2009 | 130,731 | 39,479 | 151,031 | 142,414 | 63,136 | 1,583,665 | 170,450 | 27,713 | 313,881 | 1,889,149 | 2,308,619 | 2,203,030 | 4,511,649 |
| 2010 | 141,177 | 41,866 | 164,429 | 156,270 | 70,515 | 1,719,462 | 192,956 | 25,378 | 333,679 | 2,049,272 | 2,512,052 | 2,382,951 | 4,895,003 |
| 2011 | 150,408 | 44,033 | 176,346 | 169,166 | 77,326 | 1,845,495 | 213,991 | 23,035 | 352,913 | 2,203,493 | 2,699,799 | 2,556,406 | 5,256,206 |
| 2012 | 158,487 | 45,992 | 186,861 | 181,150 | 83,597 | 1,962,242 | 233,626 | 20,686 | 371,602 | 2,352,038 | 2,872,641 | 2,723,640 | 5,596,281 |
| 2013 | 165,477 | 47,753 | 196,049 | 192,267 | 89,355 | 2,070,160 | 251,928 | 18,333 | 389,764 | 2,495,124 | 3,031,321 | 2,884,888 | 5,916,209 |
| 2014 | 171,436 | 49,326 | 203,981 | 202,558 | 94,625 | 2,169,687 | 268,962 | 15,979 | 407,415 | 2,632,962 | 3,176,555 | 3,040,377 | 6,216,931 |
| 2015 | 176,422 | 50,722 | 210,725 | 212,065 | 99,434 | 2,261,240 | 284,789 | 13,625 | 424,571 | 2,765,753 | 3,309,021 | 3,190,324 | 6,499,345 |
| 2016 | 180,487 | 51,950 | 216,346 | 220,826 | 103,803 | 2,345,219 | 299,468 | 11,273 | 441,248 | 2,893,689 | 3,429,372 | 3,334,937 | 6,764,308 |
| 2017 | 183,683 | 53,018 | 220,907 | 228,879 | 107,756 | 2,422,005 | 313,055 | 8,925 | 457,460 | 3,016,957 | 3,538,228 | 3,474,417 | 7,012,645 |
| 2018 | 186,059 | 53,936 | 224,466 | 236,259 | 111,315 | 2,491,965 | 325,604 | 6,583 | 473,224 | 3,135,735 | 3,636,186 | 3,608,959 | 7,245,145 |
| 2019 | 187,662 | 54,711 | 227,079 | 243,000 | 114,499 | 2,555,446 | 337,167 | 4,248 | 488,552 | 3,250,194 | 3,723,812 | 3,738,746 | 7,462,558 |
| 2020 | 188,536 | 55,352 | 228,802 | 249,135 | 117,328 | 2,612,781 | 347,793 | 1,921 | 503,459 | 3,360,499 | 3,801,648 | 3,863,958 | 7,665,605 |
| *forecast under free movements of workers (nationals residing in the EU-15 in persons)* | | | | | | | | | | | | | |
| 2006 | 79,094 | 32,020 | 106,618 | 102,455 | 40,826 | 1,039,283 | 109,336 | 30,265 | 246,187 | 1,045,873 | 1,539,898 | 1,292,060 | 2,831,958 |
| 2007 | 105,918 | 33,998 | 119,465 | 111,631 | 46,554 | 1,280,756 | 120,728 | 32,347 | 272,521 | 1,550,240 | 1,851,395 | 1,822,761 | 3,674,157 |
| 2008 | 135,413 | 39,185 | 153,674 | 129,543 | 56,627 | 1,437,886 | 143,097 | 36,031 | 310,851 | 1,747,009 | 2,131,456 | 2,057,860 | 4,189,316 |
| 2009 | 163,082 | 44,064 | 185,751 | 146,413 | 66,077 | 1,585,241 | 164,112 | 39,484 | 346,668 | 1,933,606 | 2,394,224 | 2,280,274 | 4,674,498 |
| 2010 | 189,012 | 48,649 | 215,797 | 162,287 | 74,934 | 1,723,282 | 183,837 | 42,718 | 380,092 | 2,110,484 | 2,640,516 | 2,490,576 | 5,131,092 |
| 2011 | 213,284 | 52,954 | 243,907 | 177,214 | 83,225 | 1,852,451 | 202,332 | 45,743 | 411,240 | 2,278,080 | 2,871,110 | 2,689,320 | 5,560,430 |
| 2012 | 235,978 | 56,993 | 270,174 | 191,236 | 90,977 | 1,973,172 | 219,656 | 48,569 | 440,221 | 2,436,809 | 3,086,755 | 2,877,030 | 5,963,785 |
| 2013 | 257,170 | 60,777 | 294,687 | 204,397 | 98,216 | 2,085,848 | 235,864 | 51,205 | 467,139 | 2,587,071 | 3,288,163 | 3,054,210 | 6,342,374 |
| 2014 | 276,930 | 64,318 | 317,530 | 216,736 | 104,967 | 2,190,867 | 251,010 | 53,661 | 492,097 | 2,729,246 | 3,476,019 | 3,221,343 | 6,697,362 |
| 2015 | 295,329 | 67,629 | 338,783 | 228,294 | 111,253 | 2,288,598 | 265,144 | 55,945 | 515,191 | 2,863,703 | 3,650,974 | 3,378,894 | 7,029,868 |
| 2016 | 312,432 | 70,721 | 358,524 | 239,106 | 117,096 | 2,379,396 | 278,314 | 58,066 | 536,511 | 2,990,789 | 3,813,655 | 3,527,300 | 7,340,955 |
| 2017 | 328,303 | 73,603 | 376,827 | 249,208 | 122,519 | 2,463,599 | 290,569 | 60,031 | 556,147 | 3,110,842 | 3,964,659 | 3,666,989 | 7,631,648 |
| 2018 | 343,002 | 76,286 | 393,762 | 258,635 | 127,542 | 2,541,530 | 301,951 | 61,849 | 574,183 | 3,224,181 | 4,104,557 | 3,798,364 | 7,902,921 |
| 2019 | 356,586 | 78,780 | 409,396 | 267,419 | 132,185 | 2,613,500 | 312,504 | 63,526 | 590,699 | 3,331,115 | 4,233,896 | 3,921,814 | 8,155,710 |
| 2020 | 369,111 | 81,094 | 423,796 | 275,591 | 136,466 | 2,679,804 | 322,269 | 65,070 | 605,772 | 3,431,938 | 4,353,200 | 4,037,710 | 8,390,910 |

Own Projection. See text for assumptions.

The annual net immigration or, more precisely, the net growth of the number of foreign residents from the NMS-8 will decline from about 237,000 persons at the beginning of the projection period to 78,000 in 2020 under the transitional arrangements. In case of introducing the free movement, this figure will increase to about 280,000 persons p.a. at the beginning of the projection period. The net increase of the foreign residents from the NMS-2 is estimated to be about 194,000 persons at the beginning of the projection period and at 125,000 persons at the end under the current immigration restrictions. An introduction of the free movement will increase this figure to 235,000 persons p.a. at the beginning of the projection period. Compared to the average net inflows during the first three years under the transitional arrangements our model predicts that the net inflows will slightly decline, which can be already observed in 2008 e.g. in the UK.

[10] The start values of the migration stocks deviate slightly from those provided in Deliverable 2 since the data sources on which the estimates are based differ for consistency reasons in some countries from those presented in Deliverable 2.

## Table 6.2 Projection of the net growth of migration stocks, 2008-2020

| | CZ | EE | HU | LT | LV | PL | SK | SI | BG | RO | NMS-8 | NMS-2 | NMS-10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *forecast under status quo conditions (nationals residing in the EU-15 in persons)* | | | | | | | | | | | | | |
| 2007 | 26,824 | 1,978 | 12,846 | 9,175 | 5,727 | 241,474 | 11,392 | 2,081 | 26,334 | 504,367 | 311,498 | 530,701 | 842,199 |
| 2008 | 13,084 | 2,863 | 16,607 | 15,921 | 8,605 | 156,848 | 25,671 | -2,310 | 20,981 | 172,647 | 237,289 | 193,627 | 430,917 |
| 2009 | 11,729 | 2,619 | 14,959 | 14,863 | 7,977 | 146,061 | 24,050 | -2,324 | 20,379 | 166,262 | 219,935 | 186,641 | 406,576 |
| 2010 | 10,446 | 2,387 | 13,397 | 13,855 | 7,379 | 135,797 | 22,506 | -2,335 | 19,798 | 160,123 | 203,433 | 179,921 | 383,354 |
| 2011 | 9,230 | 2,167 | 11,917 | 12,896 | 6,811 | 126,033 | 21,035 | -2,343 | 19,234 | 154,221 | 187,747 | 173,455 | 361,202 |
| 2012 | 8,079 | 1,959 | 10,515 | 11,984 | 6,271 | 116,747 | 19,635 | -2,349 | 18,689 | 148,545 | 172,841 | 167,234 | 340,075 |
| 2013 | 6,990 | 1,761 | 9,188 | 11,116 | 5,758 | 107,918 | 18,302 | -2,353 | 18,162 | 143,087 | 158,681 | 161,248 | 319,929 |
| 2014 | 5,960 | 1,573 | 7,932 | 10,291 | 5,271 | 99,527 | 17,034 | -2,354 | 17,651 | 137,838 | 145,233 | 155,489 | 300,722 |
| 2015 | 4,985 | 1,396 | 6,744 | 9,507 | 4,808 | 91,553 | 15,827 | -2,354 | 17,156 | 132,791 | 132,466 | 149,947 | 282,413 |
| 2016 | 4,065 | 1,228 | 5,621 | 8,761 | 4,369 | 83,979 | 14,679 | -2,352 | 16,677 | 127,937 | 120,350 | 144,613 | 264,964 |
| 2017 | 3,196 | 1,068 | 4,560 | 8,053 | 3,953 | 76,787 | 13,587 | -2,348 | 16,213 | 123,268 | 108,857 | 139,481 | 248,338 |
| 2018 | 2,376 | 918 | 3,559 | 7,380 | 3,558 | 69,959 | 12,549 | -2,342 | 15,764 | 118,778 | 97,957 | 134,541 | 232,499 |
| 2019 | 1,603 | 775 | 2,614 | 6,741 | 3,184 | 63,481 | 11,563 | -2,335 | 15,328 | 114,459 | 87,626 | 129,787 | 217,413 |
| 2020 | 874 | 641 | 1,723 | 6,135 | 2,829 | 57,336 | 10,626 | -2,327 | 14,906 | 110,305 | 77,837 | 125,212 | 203,048 |
| *forecast under free movements of workers (nationals residing in the EU-15 in persons)* | | | | | | | | | | | | | |
| 2007 | 26,824 | 1,978 | 12,846 | 9,175 | 5,727 | 241,474 | 11,392 | 2,081 | 26,334 | 504,367 | 311,498 | 530,701 | 842,199 |
| 2008 | 29,495 | 5,187 | 34,210 | 17,912 | 10,073 | 157,130 | 22,369 | 3,684 | 38,329 | 196,769 | 280,060 | 235,098 | 515,158 |
| 2009 | 27,669 | 4,879 | 32,077 | 16,869 | 9,450 | 147,354 | 21,015 | 3,454 | 35,817 | 186,597 | 262,768 | 222,414 | 485,182 |
| 2010 | 25,930 | 4,585 | 300,455 | 15,875 | 8,857 | 138,041 | 19,725 | 3,234 | 33,425 | 176,879 | 516,701 | 210,303 | 727,004 |
| 2011 | 24,272 | 4,305 | 28,110 | 14,926 | 8,291 | 129,169 | 18,495 | 3,025 | 31,148 | 167,596 | 230,595 | 198,743 | 429,338 |
| 2012 | 22,694 | 4,038 | 26,267 | 14,022 | 7,752 | 120,721 | 17,324 | 2,826 | 28,981 | 158,729 | 215,645 | 187,710 | 403,354 |
| 2013 | 21,191 | 3,784 | 24,513 | 13,161 | 7,239 | 112,676 | 16,208 | 2,636 | 26,919 | 150,262 | 201,408 | 177,180 | 378,589 |
| 2014 | 19,761 | 3,542 | 22,843 | 12,340 | 6,751 | 105,019 | 15,146 | 2,456 | 24,958 | 142,176 | 187,855 | 167,134 | 354,989 |
| 2015 | 18,399 | 3,311 | 21,253 | 11,557 | 6,286 | 97,732 | 14,134 | 2,284 | 23,093 | 134,456 | 174,956 | 157,550 | 332,505 |
| 2016 | 17,103 | 3,091 | 19,741 | 10,812 | 5,844 | 90,798 | 13,171 | 2,121 | 21,321 | 127,087 | 162,681 | 148,407 | 311,088 |
| 2017 | 15,871 | 2,882 | 18,303 | 10,103 | 5,423 | 84,203 | 12,254 | 1,965 | 19,636 | 120,053 | 151,004 | 139,689 | 290,692 |
| 2018 | 14,699 | 2,683 | 16,935 | 9,427 | 5,023 | 77,932 | 11,382 | 1,818 | 18,036 | 113,340 | 139,898 | 131,375 | 271,274 |
| 2019 | 13,584 | 2,494 | 15,635 | 8,784 | 4,642 | 71,970 | 10,553 | 1,677 | 16,516 | 106,934 | 129,339 | 123,450 | 252,789 |
| 2020 | 12,526 | 2,314 | 14,399 | 8,172 | 4,281 | 66,304 | 9,765 | 1,544 | 15,073 | 100,823 | 119,304 | 115,895 | 235,199 |

Own Projection. See text for assumptions.

The scenarios presented in Table 6.1 and Table 6.2 refer to our point estimates. However, actual migration stocks and flows may deviate substantially from the point estimates. The forecast intervals which we have derived by bootstrapping are pretty large: In Poland, the lower bound of the 95-per cent interval stands at about two million persons, while the upper bound predicts about 3.2 million persons in 2020 (Figure 6.1). Similarly, in Romania the lower forecasting bound amounts to about 3 million persons, while the upper bound estimates the migration potential in 2020 at about 3.7 million persons (Figure 6.2). Overall, we expect that the migration potential from the NMS can be about one-third above or below the point forecast of the migration stock in 2020.

**Figure 6.1 Forecast intervals for Poland, 2008-2020**

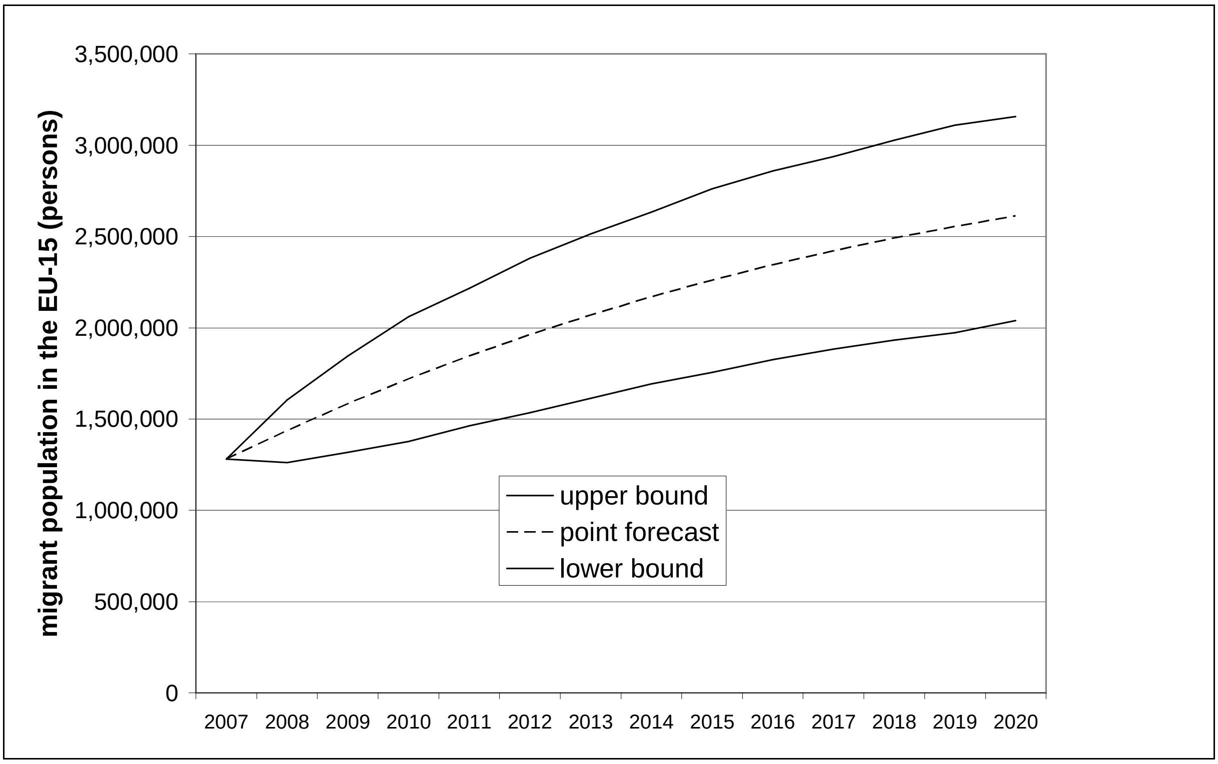
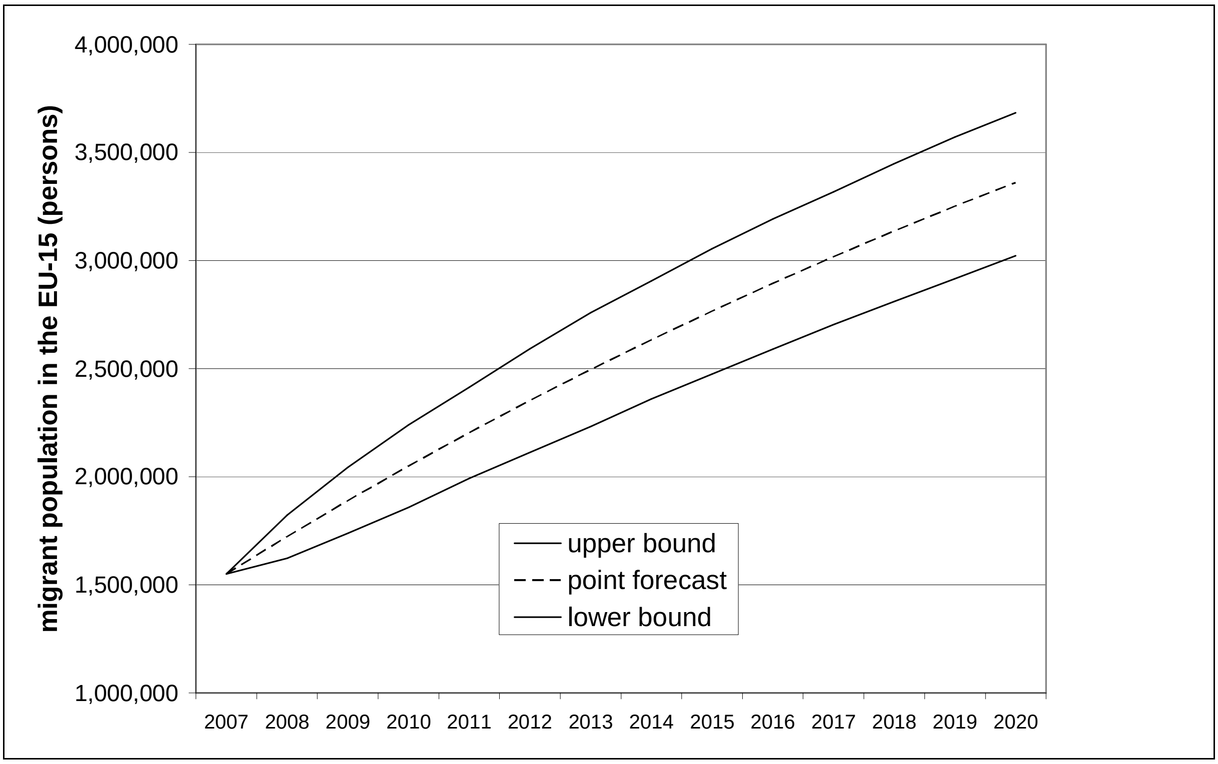



**Figure 6.2 Forecast intervals for Romania, 2008-2020**




A number of caveats apply to these estimates: First, the estimates under the current institutional conditions are based on only three annual observations, which might be insufficient to identify the parameters of the model properly. Second, the free movement scenario assumes that the slope parameters for the explanatory variables such as the income difference and the employment rates are the same under free movement for the EU-15 sending countries and the NMS. This need, however, not to be the case. Third, particularly the migration data used for the estimates are subject to measurement error which may bias the results in one way or another. Finally, the projections presented here are based on estimates of long-run equilibrium relationships between the migration stocks and the explanatory variables and the speed of adjustment to these long-run relationships. The estimates do therefore not capture short-term fluctuations in the business cycle appropriately, such that short-term migration movements may deviate substantially. This is particularly relevant in the context of the current financial crisis (see below).

Thus, the projections presented here provide no more than a clue to the possible development of future migration movements from the NMS and should therefore be interpreted with great care.

# 7 The impact of the financial crisis

The current financial crisis may reduce the short-term migration substantially compared to the projections presented in Table 6.1 and Table 6.2. It is an open question at present whether the NMS or the EU-15 will be more than proportionally affected by the financial crisis. According to the recent forecasts, important sending countries such as Poland and Romania are less affected by the decline in GDP growth than the EU-15 countries, while others such as Hungary and the Baltic countries are more than proportionally affected. Nevertheless, since Poland and Romania alone account for about 80 per cent of the migrant population, these developments would reduce the short-term migration potential.

More importantly, it is worthwhile noting that employment opportunities in the receiving and the sending countries do not affect the scale of migration in a symmetric way. Migration is largely driven by the opportunity to work, which in turn depends on the opportunity to find employment in the receiving countries. If employment opportunities in the receiving countries tend to decline, net immigration contracts irrespective of migration conditions in the sending countries. In the two main destinations of migrants from the NMS in the EU-15 in absolute terms, the United Kingdom and Spain, unemployment has already started to increase substantially in the course of the current financial crisis. Moreover, the prospects are bleak for 2009 according the forecasts of the national governments and the European Commission. As a consequence, immigration from the NMS will decline in these destinations, while return migration will tend to increase. Net migration figures might thus decline or even become negative in the course of the crisis, although the exact impact is uncertain at the present stage. Altogether, labour mobility between the EU-15 and the NMS will act as a buffer for natives in the receiving countries in the current crisis, while it might further increase unemployment in the sending countries if return migration becomes large.

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