IMPLICATIONS OF EU ACCESSION FOR INTERNATIONAL MIGRATION: AN ASSESSMENT OF POTENTIAL MIGRATION PRESSURE

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Abstract

This paper estimates the potential migration from eight EU accession countries as well as Bulgaria and Romania as a result of the eastern enlargement. The experience of migration from Greece, Portugal and Spain is used to estimate the parameters of a migration function, exploiting panel estimation techniques. The results from the models are then used for so-called double out of sample extrapolations - for ten countries that are not within the estimated sample and for the time period in the future. It was found that potential migration flows from central and eastern Europe will be modest. Moreover, legal introduction of free movement of workers seems not to increase migration significantly, contrary to what one might expect.

JEL classification: F22, J11, J61.

Keywords: international migration, migration projections, EU enlargement, panel estimation.

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1 Introduction

In the light of approaching European Union (EU) enlargement [1] labor migration issues have attracted huge public attention, and due to intensive political pressure a transition period of up to 7 years for the free movement of labor from new member states was accepted. Similar transition periods were introduced after the accession of southern countries, Greece in 1981, Portugal and Spain in 1986, however in spite of income differentials the flows of immigrants from these new members were quite small (Eurostat 2000; Boeri et al 2000; Kraus and Schwager 2000). In the case of German unification, despite large income differentials migration has stabilised since 1994 at a rather low rate (Burda 1995; Hunt 2000). The current enlargement is unprecedented: income differentials are large (from 30% in Lithuania, to 69% in Slovenia), there exist no previous free migration record, eastern European countries have undertaken transition from socialist to market economy and they represent quite heterogenous set of countries. Since large wage and income gaps between these regions are likely to continue for decades, strong economic incentives to migrate will also be present. However, it is also well known that international migration is hindered by high transaction costs, limited absorptive capacities of the receiving countries' labor markets and by existing cultural and linguistical heterogeneity within Europe.

The attitudes towards immigration from CEECs remain controversial. The adoption of the common currency within the EMU means that labour mobility could become an important source of dampening negative impacts of idiosyncratic shocks. On the other hand, there exist political concerns of the huge flows of immigrants from CEECs, which could destroy the western welfare state. [2] It is not quite clear whether immigration implies net benefits or costs for the economy overall, however, it is obvious that the effects of CEECs citizens' immigration on the EU labor markets will depend first of all upon magnitude (and distribution) of immigration [3].

Will immigration from East be large after accession and / or increase substantially after introduction of free movement of workers? This is a question I attempt to answer in this paper. I use panel data to account for sources of heterogeneity and idiosyncrasity, explicitly control for both receiving and sending countries specific fixed effects and attempt to use them for the extrapolations and, finally, present also some reflections on the legal introduction of free movement for CEECs. Throughout the paper I define ten central and eastern European countries to include: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. Although Bulgaria and Romania are not within the 2004 accession countries due to economic underdevelopment, they will join the Union later (perhaps in 2007). Malta and Cyprus are not included, since both countries are small and their economic situation is significantly better than the situation of the CEECs. I use migration experience from Greece, Portugal and Spain to estimate the parameters of the migration function, since they provide a somewhat comparable situation to eastern enlargement in terms of income differentials, population sizes and transition

[1] In May 2004 Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia will join the EU.

[2] See Bauer and Zimmermann (1999) for analysis, Sinn (2000) for implications for welfare state, The Economist (2004) for a discussion of potential immigration after EU enlargement.

[3] See, for instance, Borjas (1999) for the cost-benefit analysis of immigration, Ichino (1993) for theoretical review of the effects of immigration.

periods regarding free movement [4]. Then I use the estimated parameters for extrapolation to the CEECs. Such analysis is always complicated due to data scarcity and reliability problems, distinction between stocks and flows of migration and even absence of common definition of migration. Certain methodological problems are inevitable due to so-called double out of sample projections - for ten countries that have not been included in the estimated sample and for the time period outside the estimation period. Moreover, studies that use country-specific fixed effects to account for unexplained variation face a serious problem: it is unclear which country-specific intercepts should be used when predicting future migration for countries with no previous record of free migration. Obviously, such "guesstimates" should be taken with caution. Nevertheless, this paper suggests that the overall level of migration from the East within a decade after enlargement will amount to around 1% of the EU15 population and the legal introduction of free movement of workers will not increase immigration significantly, contrary to what one might expect.

Empirical studies that forecast future migration flows from the accession countries vary in the range of variables they include and the specifications remain rather *ad hoc*. Typically, in the first step, the association between past migration flows from the countries other than CEECs and explanatory variables is estimated, and in the second step, future migration flows are predicted based on estimated results. In order to use the coefficients obtained in the first step to predict future migration flows from the CEECs existing studies assume that migration decisions will respond to the same factors in the same way in the future for out of sample countries, i.e. assume equality of slope coefficients. Orlowski et al (2000) exploit a standard gravity model approach to estimate potential migration flows from ten CEECs to the regions of Austria and report quite large results. Alecke et al (2001) consider single Spanish - German case and show that standard gravity model consistently overestimates migration and that one should include sending and / or receiving countries-specific effects to account for many push and pull factors suggested by modern migration theory. Bauer and Zimmermann (1999) base their estimates on southern EU enlargement and show that the largest emigration rates are expected for Romania, Bulgaria and Poland as and the lowest rate for Slovenia, but the overall results are large. Hille and Straubhaar (2001) also exploit southern EU enlargement for estimation and suggest potential migration from ten CEECs into the EU to range between 270,000 and 790,000 citizens per annum. However, it is unclear how these studies deal with countries-specific intercepts. Fertig (2000) and Boeri et al (2000) exploit different approach. They analyze immigration from seventeen different countries into Germany in a time-series error correction framework. To solve the problem of sending countries fixed effects for out of sample countries, these fixed effects are regressed in the second stage on time-invariant distance and country development indicators. The estimated coefficients are then used to assess immigration flows from ten CEECs. Boeri et al (2000) estimate immigration flows of 300,000 - 400,000 persons from ten CEECs into the EU upon accession under free movement arrangement, which will decline subsequently, amounting to the stock of 2.9-4.5 million persons by 2015 depending upon the income convergence scenario. The largest migration is expected from Romania, Bulgaria and Poland and the most highly affected countries are Germany and Austria. Fertig

[4] PPP GDP per capita in the CEECs is around 45% of the EU average; in the three southern countries it was around 65% of EC average in 1981. Population sizes in both cases amount to around 20% of current EU member states.

(2000) finds that under the free movement arrangement, immigration flows into Germany would increase only by 5% and decline subsequently. A recent study by Sinn et al (2002) found much bigger migration potential into Germany, estimating time-series vector error correction model. Finally, Dustmann (2003) uses data on migration from seventeen different countries into Germany, employs a variance-components model for estimation and shows that, depending upon the empirical model specification and forecasting scenario used, one can get net immigration flows from ten accession countries into Germany to range between 20,000 and 200,000 persons. All such studies are subject to many problems and criticism. The main methodological problems are double out of sample extrapolations and associated forecast errors, assumption that estimated parameters will have the same relevance for new member states, strong assumptions about future development of explanatory variables. Many studies impose additional restrictions, such as expressing country-specific intercepts as a combination of observable characteristics only, omitting lagged dependent variable, or using a combination of all these. Moreover, EU enlargement and potential migration is a perfect application of the Lucas critique. Some researchers try to overcome some of the problems, for instance by including country-specific effects, however it remains "more than crucial" how the country-specific effects are defined and applied to the CEECs, which have no historical experience of free migration (Straubhaar 2001). [5]

The rest of the paper is structured as follows. Section 2 provides a simple theoretical model for the migration decision. Empirical models and estimation results of the migration function are presented in section 3, and extrapolations for CEECs and comparison of the results with existing studies - in section 4. Section 5 concludes.

2 Theoretical framework

The basic framework within which most models of migration are viewed is neoclassical migration theory, in which migration decisions are based on considerations of the relative expected future incomes adjusted for the costs of migrating (Harris and Todaro 1970). The individual migrates if expected income (expected utility) in the host country is greater than the expected income in the country of origin. Sjaastad (1962) views migration as an investment in human capital and heterogeneity among individuals is emphasized. The model argues that, depending on their skill levels, individuals calculate the present discounted value of expected returns on their human capital and migration occurs if the returns, net of the discounted costs of movement (both material and psychological), are larger in a destination country than in the country of origin. The objective function thus takes the form:

$$V_E(y_h, y_f, c, t) = \int_0^\infty (y_f(t) - y_h(t))e^{-\rho t} dt - c$$

where $y_f(t)$ and $y_h(t)$ denote foreign and domestic earnings at time t, c is the cost of migration and ρ is the discount rate. The optimal decision rule induces migration when $V_E(t) > 0$.Ghatak

[5] Fertig and Schmidt (2001) argue that a convincing choice of the country-specific intercepts for countries for which no previous migration record exists is the principal conceptual challenge for the prediction - yet, this identification problem has not been addressed formally in any of the previous papers on this topic.

et al (1996) argue that liquidity constraints of individuals should be taken into account. People who wish to migrate generally face liquidity / borrowing constraints and a marginal rise in home country's income might simply ease such constraints and raise the rate of migration. The network approach (Massey 1993) incorporates migrant networks - sets of interpersonal, cultural or linguistical ties that connect migrants and non-migrants in the origin and destination countries. According to this framework, migration may become a self-perpetuating process, because costs and risks of migration are decreasing with the stock of migrants already living in the host country, leading to higher net returns on mobility.

These arguments can be used to derive an estimable micro-founded model of the migration rate. The model has two important features: it incorporates uncertainty into the migration decision and postulates that migration decisions are based upon expectations of future economic developments [6]. Suppose that the probability of migration of individual i (i=1,...,n) from the home country (h) to the foreign country (f) in a given year depends on the difference in expected utility streams in the two locations (d_i), minus the composite cost of migration (z_i)[7]. The utility function is assumed to be concave and, specifically, given by $u(y)=ln(y)$. Hence:

$$d_i = E\ln(y_f) - E\ln(y_h) + z_i \tag{1}$$

Expanding $Eln(y_f)$ around $E(y_f)$ using a second-order Taylor series expansion gives:

$$E\ln(y_f) = \ln(Ey_f) - \frac{1}{2}\frac{Var(y_f)}{(Ey_f)^2} \tag{2}$$

Following Harris and Todaro (1970) by denoting $E(y)=we$, the real wage times the probability of employment, aggregating over individuals and assuming that the cost of migration depends on MST_t, the stock of previous emigrants at time t (network effect), one can derive the following aggregate emigration rate (see Appendix):

$$\begin{aligned} M_t \;=\; & (1-\lambda)\beta\ln(\frac{w_f}{w_h})_t + (1-\lambda)\beta\frac{3}{2}\ln(e_f)_t - (1-\lambda)\beta\gamma\frac{3}{2}\ln(e_h)_t + \\ & +(1-\lambda)\beta\varepsilon_1 MST_t + (1-\lambda)\beta\varepsilon_2 t + \lambda\beta M_{t-1} + (1-\lambda)\beta\varepsilon_0 \end{aligned} \tag{3}$$

The emigration rate, adjusted by the population of the home country, is a function of relative wages and relative (un)employment rates in the host and home countries, the existing stock of migrants, the lagged migration rate, and a time trend.

Due to severe data limitations or a problem of finding proper quantitative measures empirical work usually cannot take into account all socio-economic push and pull factors that affect migration, such that tradition and networks, ethnic and political problems, cultural and linguistic barriers as well as geographic proximity. Moreover, in the real data variables, especially institutional factors, are often highly correlated leading to the problems of endogeneity. Some problems can be solved

[6] The small strand of theoretical literature use the option value theory of migration (Burda 1995). In these models, if one can observe the state of foreign economies, if migration decision is postponable and if one expects future income convergence (all these due to, say, joining an economic union with the foreign country) it is better to wait and not to migrate.

[7] These costs include both material and psycological costs of migrating.

by using fixed or random effects models, when for the former correlation between country-specific fixed effects and regressors is assumed, however, it remains ambigous how these fixed effects can be used for out of sample projections. Next section suggests a solution.

3 Data, methodology and estimation results

In this section I present my own attempt to estimate a migration equation. Existent empirical studies in spite of the large heterogeneity conclude that at least 3% of CEECs population will move West and seem not to identify a substantial increase in the immigration after introduction of free movement. I use the historical experience of Greece, Portugal and Spain, since in line with existing studies I have to assume that accession countries will respond to the same factors in the same way in the future, as well as assume homoscedasticity and no correlation across regions and time, thus, choosing a heterogenous sample of sending countries could be more problematic. I choose panel fixed effects estimation technique on the basis of diagnostic tests and willing to account for country-specific time-invariant factors that influence migration. I try two models specifications: first, with receiving countries-specific effects only, and, second, with interactions between sending and receiving countries-specific effects, modelling explicitly the differences in country-specific intercepts by time constant factors. I also hope that the latter procedure contributes to reducing the problem of restricting the slope coefficients to be equal across countries. I omit a lagged dependent variable, since including it leads to inconsistent estimates in the fixed effects estimation (I use stock of migrants instead). The results are within the lowest tail of distribution among other studies, however they are subject to many statistical problems (see above), small number of observations being one of them. [8]

3.1 Data

The data used for estimation cover emigration from Greece, Portugal and Spain into the EU countries over time period 1985-1997, as well as GDPs per capita in PPP, unemployment rates (as defined by the ILO) and populations in the Southern countries and in all EU member states. The original T. Bauer's dataset was augmented by geographical distance (distance between two countries' capitals) from the Bali Online distance calculator [9], a Human Development Index from the United Nations (2002), annual percentage GDP growth, foreign direct investment (FDI) net inflows and total trade with the EU (exports plus imports) in current prices from the IMF Direction of Trade Statistics database and Eurostat Yearbook (various issues). For the extrapolations, GDPs per capita in PPP, unemployment rates and population in the CEECs as well as the EU in the year 2000 were taken from Eurostat Yearbook 2002 and World Bank's World Development Indicators

[8] The non-logarithmic specification of dependent variable saves only 13 observations. Since the data is non-existent before 1985 and there exist missing observations, one could use either a different data set to check the robustness of the results, or a selection model to deal with missing observations. Nevertheless, while realising the problem, I follow, for instance, Bauer and Zimmermann (1999), Alecke et al (2001) or Mitchell and Pain (2003) who use small samples for their migration analysis.

[9] Except for Slovakia-Austria, where distance between Bratislava-Salzburg was calculated, and Estonia-Finland, where distance between Tallinn-Turku was calculated (since the distance between the capitals in these cases is too small to be representative).

database. The stock of migrants from CEECs is extracted from Eurostat's New Cronos database. Finally, CEECs' GDP growth scenarios are taken from Orlowski et al (2000), where they were calculated according to endogenous growth theory for pessimistic scenario (low GDP growth) and optimistic scenario (high GDP growth).

The dependent variable used in all the models is the net immigration rate - the ratio of the yearly immigrant inflows into the EU member states (change in stocks) to the population of sending countries. [10] Descriptive statistics of the variables are presented in Table 1 and Figure 1 shows the mean stocks of immigrants from Greece, Spain and Portugal in the EU member states before and after introduction of free movement.

Table 1: Summary statistics

Variable	Mean	St. dev.	Min	Max
GDP, receiving	95	19	55.4	150.3
GDP, sending	66	7	55.4	77.2
unempl., receiving	9	5	1.6	24.1
unempl., sending	11	7	4	24.1
stock of migrants	28308	66042	0	359556
population, receiving	24740	26486	393	81896
population, sending	19822	13681	9862	39270
distance	2099	696	501	3362
HDI	0.85	0.03	0.79	0.9
immigration rate	0.14	0.37	0.00005	2.59
log immigration rate	-4.8	2.6	-9.9	0.9
log gdp ratio	0.3	0.2	-0.3	0.8
log unempl. ratio	-0.2	0.8	-2.4	1.5
log stock of migrants	8.1	2.4	2.8	12.8
free movement	0.6	0.5	0	1

Notes: Sending countries: Spain, Portugal, Greece. Receiving countries: EU15. Period: 1986-1997. Final number of observations: 169. GDP, rec. is PPP GDP per capita in the receiving countries (EU15=100), GDP, send. is PPP GDP per capita in the sending countries (EU15=100), unempl, rec. and unempl, send. are unemployment rates as defined by ILO in receiving and sending countries, stock of migrants is number of immigrants from relevant sending country residing in the receiving country, population, rec. and population, send. are population in thousands, distance is geographical distance in km. between the capitals of sending and receiving countries, HDI is Human Development Index, immigration rate is inflows of immigrants from sending to receiving countries, divided by origin's country's population, gdp ratio is the ratio of GDP per capita of receiving country to sending country, unempl. ratio is the ratio of unemployment rate of receiving country to sending country, free movement is dummy which is equal to 1 after legal introduction of free movement for Greece, Spain and Portugal.

A first look at the descriptive statistics suggest that introduction of free movement of workers did not contribute to the substantial increase in the immigration from Greece, Portugal and Spain; the stock of Greeks in the other EU countries has even decreased after 1988. One of the possible explanations could be that almost 3% of the population of the southern accession countries had

[10] Only immigration flows after 1986 were considered in order to estimate the immigration after accession to the EU, since data before accession for Greece is non-existent.

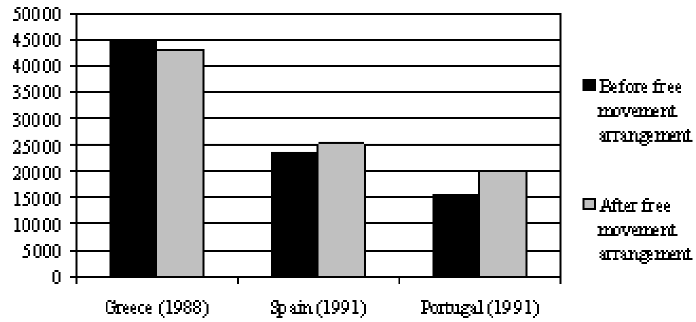

Figure 1: Mean stock of immigrants from Greece, Spain and Portugal in the EU before and after introduction of free movement. Source: T. Bauer's dataset. Notes: the figure should be treated with caution, since there are missing observations in the data.

migrated into the EU upon the time of accession already, thus the stock of immigrants in the EU was already close to its equilibrium value and introduction of free movement of workers could not have a significant impact on migration patterns anymore. Econometric analysis below provide some further insights.

3.2 Econometric models and empirical analysis

The theoretical model in Section 2 suggests that the emigration rate depends on relative incomes and unemployment rates between two locations and migrant stocks in the country of destination. This model can be extended to include other factors, such as distance, linguistical and cultural similarities into the costs function, demographic variables or lagged dependent variable. Dustmann (2003) suggests the following generic empirical model for analysing immigration into a single destination country:

$$m_{i,t} = \mu_i + X'_{i,t}\beta_i + \delta m_{i,t-1} + u_{i,t} \tag{4}$$

where $m_{i,t}$ is (log of) aggregate migration rate from sending country i in year t (adjusted by population of country i), μ_i captures all unobservable time-invariant aspects that are specific to country i, k-dimensional matrix $X_{i,t}$ denotes the observable time-varying characteristics of country i at time t (relative to the destination), $m_{i,t-1}$ is the lagged migration rate, $u_{i,t}$ is the error term reflecting all unsystematic influences, and β_i is vector of unknown parameters. Following other studies, in order to make projections I restrict $\beta_i = \beta\ \forall i$, meaning that I assume the effects of the explanatory variables are the same across countries within the sample, and will be the same for out-of-sample countries. I also omit lagged dependent variable, since including it leads to inconsistent estimates (I use stock of migrants instead) [11]. Contrary to the majority of studies, I attempt to

[11] Including lagged dependent variable leads to inconsistent estimates in present model specification. An alternative could be to account for lagged migration rate and carry out dynamic panel GMM estimation with weak endogeneity of some explanatory variables introduced by Arrelano and Bond.

explicitly control for time-invariant *both* sending and receiving countries-specific characteristics.

In a cross-country analysis unobserved country-specific omitted variables result in biased and inconsistent estimates [12]. If, however, panel fixed effects estimation is used, standard time-invariant explanatory variables, such as distance, drop out. In order to decide which model to use for extrapolations, I test first for individual heterogeneity using the Breusch-Pagan test, which compares pooled OLS to the random effects model, and reject the null of no heterogeneity. This leads to the question whether unobserved country-specific effects are correlated with the explanatory variables. I use Hausman's specification test to explore that and reject the null of zero correlation, thus fixed effects model is preferred to a random effects model. With small sample size I use the most parsimonous model with three key explanatory variables: per capita income differentials, relative unemployment rates and migrant stocks.

Following methodology in Matyas (1997, 1998) I control for receiving countries specific effects first. I also include time dummies and dummy for the legal introduction of free movement of workers as well as its interactions with explanatory variables to control for the effects of this policy. Time dummies appear to be neither individually nor jointly significant, indicating that migration inflows are determined by other controls than time[13]. The free movement dummy and all the interactions are also individually and jointly insignificant. Thus the final empirical specification is as follows:

$$\ln(M_{ijt}) = \alpha + \beta_1 \ln(\frac{GDP_j}{GDP_i})_t + \beta_2 \ln(\frac{U_j}{U_i})_t + \beta_3 \ln(MS_{ij})_t + \beta_4 FM + \lambda_j + u_{ijt} \qquad (5)$$

where M_{ijt} is immigration rate from origin country i into destination country j at time t, GDP_{jt} is per capita GDP at PPP in the country of destination at time t; GDP_{it} is per capita GDP at PPP in the country of origin at time t; U_{jt} is the unemployment rate in the country of destination at time t; U_{it} is unemployment rate in the country of origin at time t; MS_{ijt} is stock of migrants from country i in country j at time t; FM is a free movement dummy which is equal to 1 after 1988 for Greece and after 1991 for Spain and Portugal, λ_j is time-invariant fixed effect of the receiving country that captures such factors influencing migration decisions as availability of local infrastructure, access to social security, amenities and climate in the EU countries etc., u_{ijt} is a disturbance term and $\alpha, \beta_1, \beta_2, \beta_3$ and β_4 are parameters to be estimated. According to the theory I expect $\beta_1 > 0, \beta_2 < 0, \beta_3 > 0, \beta_4 > 0$.

For the extrapolations of potential migration from the CEECs, an explanation of both sending and receiving country-specific effects is needed. Both country-specific effects capture all time-invariant factors that may affect migration between them, such as distance, language similarities, common culture and history or long-term differences in endowments across countries. To be able to incorporate *both* countries specific effects and to explicitly control for time-invariant factors I use the following two-stages procedure: *in the first step*, I use interactions of sending and receiving countries (country pairs) as dummies in the original regression, *in the second step,* I estimate

[12] Standard gravity models (Anderson (1979)) perform relatively well in terms of goodness of fit, however overestimate the parameters by omitting country-specific variables. For comparative purposes I have estimated the standard gravity equation. The extrapolations based on this model were, indeed, very high. The results are available upon request.

[13] Since FM dummy might capture the time effect I have estimated the regressions without FM dummy and including time dummies only. The results haven't change: time dummies were insignificant again.

auxiliary regression and regress estimated coefficients of these countries dummies on a set of time-invariant variables (or those that can be assumed not to change dramatically over time). Thus, I use Chamberlain's idea to model panel data fixed effects as a function of time invariant characteristics (and the means of time variant variables). [14]. By estimating these individual intercepts I also hope to reduce possible misspecification from restricting the slope coefficients to be equal across countries. Thus, in the first step I include fixed effects for each *pair* of countries and estimate the regression without a constant in order to use the coefficients from all interactions in the second step. Again, neither year dummies nor interactions with FM dummy appear to be significant. The final model is as follows:

$$\ln(M_{ijt}) = \beta_1 \ln(\frac{GDP_j}{GDP_i})_t + \beta_2 \ln(\frac{U_j}{U_i})_t + \beta_3 \ln(MS_{ij})_t + \beta_4 FM + \eta_{ij} + u_{ijt} \tag{6}$$

where all the variables are as described above and η_{ij} are fixed effects for each pair of countries. In the second step these fixed effects are explained explicitly willing to include them into the forecasting scenario. Following Fertig (2000) and Boeri et al (2000) I use distance, a Human Development Index and also augment this method by including population in the receiving country, since, contrary to them, I use interactions of both sending and receiving countries and attempt to control for the effects in both countries:

$$\widehat{\eta_{ij}} = \alpha + \beta_1 DIST_{ij} + \beta_2 HDI_i + \beta_3 POP_j + u_{ij} \tag{7}$$

where $DIST_{ij}$ is a geographical distance between the capitals of two countries, HDI_i is the Human Development Index of the sending country, which captures the development status of different sending countries, POP_j is the population in the receiving country and is a proxy for labour market's absorptive capacity.

Given the above model specifications, another empirical complication is the problem of endogeneity. If one might assume that migration flows are relatively too small to induce reverse causality (the impact of immigrants on wages is the focus of analysis of many labour economists and is beyond the aim of this paper), however there might still exist confounding factors that influence contemporaneously wages, unemployment rates and migration flows. For instance, negative demand shock may drive unempoyment up or wages down (or both) and, at the same time, increase emigration. To (partly) get around this problem I use instrumental variables estimation with lagged values of income, unemployment rates and migrant stocks as instruments. I assume the following conditions hold:

$$Cov(Z, u) = 0 \tag{8}$$

$$Cov(Z, X_k) \neq 0 \tag{9}$$

where Z is l-dimensional vector of instruments, u - is the error term in structural equation and X is n-dimensional vector of explanatory variables with k endogenous elements; identification requires

[14] See Chamberlain (1985) for theoretical analysis, Dickens and Katz (1987) for application to industry differentials and Andrienko and Guriev (2003) for application to interregional mobility in Russia.

$l \geq n$. [15] I test condition (9) in the first stage regressions and the instruments seem to be strong. Besides, I can assume that since *Z's* are predetermined, immigrant inflows and confounding factors in u only affect contemporaneous and future wages, unemployment rates and migrant stocks, and thus condition (8) also holds[16].

The results of these estimations are discussed in the next subsection.

3.3 Empirical results

Table 2 presents panel estimations results that take account of individual heterogeneity. As discussed above, specification tests favour neither pooled OLS, nor random effects model, thus my preferred specification is fixed effects estimation, and the estimated coefficients are elasticities. When only receiving countries-specific effects are controlled for (column (2)), all explanatory variables are significant and have the expected signs, except for relative unemployment rates: the higher GDP per capita in the country of destination relative to the country of origin and the larger are migrants networks, the larger is migration flow into that country. Positive coefficient on unemployment ratio is somewhat in contrast with neoclassical migration theory, however it may reflect liquidity constraints of individuals in the sending countries, i.e. the higher unemployment in the sending countries, the fewer people work, the fewer *can afford* to migrate. When interactions of both sending and receiving countries-specific effects are used (column (3)), the signs do not change. However, the coefficients on relative GDP and unemployment rates become insignificant, which is unsurprising given the small number of observations relatively to regressors and collinearity with country-specific dummies. Migration inflows respond stronger to income differentials and unemployment rates when only receiving countries effects are included, however when sending countries-specific effects are added, networks become more important. Legal introduction of free movement of workers does not seem to influence significantly the immigration flows into the EU. Interestingly, coefficient on FM dummy has negative sign in column (3), however, this may be due to small variation in the data and multicollinearity. The dummy is statistically insignificant in all models specification used. [17]. Excluding FM dummy from the regressions does not change the estimated coefficients substantially (not reported). Finally, IV estimations results with receiving countries dummies are reported in column (4). Comparing to model in column (2), the coefficients did not change much and remained significant. However, this model may overestimate the true value the exclusion restrictions assumption for IV does not hold, or the instrument may not be valid if the shock is autoregressive. In both cases, assumption (8) will not hold. Therefore I prefer not to use the IV estimations for projections. [18] Moreover, FM dummy may also be endogenous (destination countries decide on proper policy regarding immigration regime conditional on the magnitude of immigration) and any change in policy can lead to the change in underlying equation

[15] I also assume that Z's are redundant in the primary migration equation. If Z's have direct impact on dependent variable, IV overestimates the true parameter values. Although this is debatable, I refer to the simple theoretical model in section 2 (one may extend the model, however, and use lagged explanatory variables in the primary regression also).

[16] However, if the residuals are autocorrelated, the instrument will be invalid.

[17] See Boeri et al (2002) for discussion.

[18] IV estimation for the model with countries pairs fixed effects delivers insignificant estimates due again to multicollinearity and is not reported here.

relations (Lucas critique). But to the best of my knowledge there exist no study so far that would try to instrument FM. In general, all estimates have the same sign and are broadly consistent with the theoretical predictions. For the projections I use two fixed effects models due to the reasons described above and call them Model 1 (column 2) and Model 2 (column 3) respectively, assuming that adding more degrees of freedom would contribute to the significance of coefficients in Model 2 while not changing the magnitudes considerably.[19]

Explanation of countries-specific effects is presented in Table 3. The estimates show that the larger the distance between countries the larger are countries specific effects, and the bigger is population in the country of destination and the higher sending country's development status the smaller is the weight of these countries specific effects. I was able to explain 56% of variation in the dependent variable and, of course, incomplete explanation of the countries specific effects reduces the forecasting power of the model even further[20].

[19] I also run three "robustness checks" for each of the fixed effects models. To account for economic integration and (possible) income convergence I add, first, annual GDP growth in the sending countries, then FDI inflows into the sending countries and, finally, total trade (exports plus imports) between sending countries and the EU instead of FDI inflows. In general, the coefficients on main explanatory variables do not change much. Moreover, these simple preliminary results seem to indicate that economic integration influence emigration negatively (also consistent with the option value of waiting theory).

[20] In Fertig (2000) R2 was 0.44 and in Boeri et al (2000) R2 was 0.42.

Table 2: Panel data regressions

Model	1	2	3	4
	Random effects	Receiving countries f.e.	Countries pairs f.e.	IV with rec. countries
Dependent variable: log immigration rate				
log gdp ratio	1.45 (1.96)**	2.55 (3.53)***	1.11 (0.85)	3.18 (3.58)***
log unempl. ratio	0.59 (3.18)***	0.81 (4.76)***	0.04 (0.15)	0.69 (3.82)***
log stock of migr.	0.84 (8.97)***	0.78 (9.85)***	2.3 (5.09)***	0.74 (7.98)***
free movement	0.01 (0.09)	0.07 (0.45)	-0.16 (0.93)	0.17 (1.00)
constant	-11.81 (-15.71)***	-11.17 (9.33)***		-11.34 (7.57)***
R-squared	0.82	0.87	0.98	0.87
Breusch-Pagan test: p-value=0.0004				
Hausman test: p-value=0.0000				

Notes: dependent variable is migration inflows adjusted by population of sending country. Receiving countries fixed effects and countries pairs fixed effects are not reported. Number of observations: 169. Heteroscedasticity corrected t-values are presented in parentheses, **significant at 5%; ***significant at 1%. gdp ratio is the ratio of PPP GDP per capita of receiving country to sending country; unempl. ratio is the ratio of unemployment rate of receiving country to sending country; stock of migr. is stock of migrants from sending country in the respective receiving country; free movement dummy is equal to 1 after legal introduction of free movement. See text for data sources.

Table 3: Explanation of Country-Specific Fixed Effects

	Coefficient	t-value
Dependent variable: countries pairs fixed effects		
distance	0.002	9.09***
HDI, send.	-24.15	4.42***
population, rec.	-0.00007	14.61***
constant	-5.06	1.08
R-squared: 0.56		

Notes: dependent variable is country-specific fixed effects retrieved from the regression of migration flows on GDP ratio, unemployment ratio, stock of migrants and both sending and receiving countries fixed effects. Number of observations: 246. t-values are heteroscedasticity corrected, ***significant at 1%. distance is geographical distance between two countries; HDI,send. is Human Development Index of sending country; population,rec. is population of receiving country. See text for data sources.

4 Extrapolations for CEECs

For the out of sample projections the coefficients estimated above in Model 1 and Model 2 are combined with the data on GDP per capita, unemployment rate and migrants stock for ten central and eastern European countries[21]. The following assumptions were made for predictions:

- Annual GDP growth for CEEC10 was taken from Orlowski (2000) where it was calculated

[21] Data for the stock of immigrants from CEECs in Greece is of 1998, France – 1999, Austria – 1999.

according to endogenous growth theory for two scenarios: a low growth (pessimistic) and a high growth (optimistic). Using these growth rates I have calculated GDPs per capita for ten CEECs until 2015;

- GDP in the EU is assumed to grow at conventional 2% rate (see, for instance, Boeri and Brücker et al (2000));
- Population in both regions is assumed to remain unchanged (*ibid*);
- Year 2000 unemployment rates for both regions are assumed to remain unchanged (*ibid*);
- The level (stock) of migrants is assumed to stay constant due to two-ways migration (Boeri and Brücker et al (2000), Hille and Straubhaar(2001));
- Free movement of workers is assumed to be introduced in 2011;
- Extrapolations are based on the coefficients estimated in section 4;
- Knowing that Bulgaria and Romania will not join the Union in 2004, I still include these two countries into the projections as if they would, to compare the results with the actual accession countries.

Model 1 predicts immigration flows to the EU around 254 888 (pessimistic GDP growth scenario) / 233 440 (optimistic GDP growth scenario) upon accession. Model 2 yields an increase in the number of residents from CEEC10 at the time of accession to amount to 343 144 (pessimistic GDP growth scenario) / 330 244 (optimistic GDP growth scenario). In all specifications the majority of migrants are coming from Romania, Poland and Bulgaria, which is in line with the other studies and expectations. One could expect the number of emigrants to be greater when controlling for both regions fixed effects, the reason being that on average a bad economic situation in accession countries would contribute to the willingness to migrate. While it is true on aggregate level, the situation is reversed for Bulgaria, Hungary, Lithuania and Romania. The possible explanations could include liquidity constraints for Bulgaria and Romania, data reliability (for instance, unemployment rate reported for Romania in 2000 is 7%) or migration costs that outweigh the benefits from moving abroad. Overall, the results yield a flow rate around 0.3 million immigrants upon accession, while current flows from CEECs to the EU are also around 0.3 million, mostly to Germany.[22] The majority of immigrants in absolute numbers would come to Germany, Austria, Italy and the UK, broadly consistent with existing studies. Sweden may also be affected, which can be expected given its social security system, low unemployment rate and minor geographical distance to the accession countries. Thus, the inflows of CEECs citizens upon accession would constitute around 0.1% of the EU15 population. The simulated immigration rates will decline in the future, and depending on the growth scenario and model specification, by 2014 will amount to 172 830 (pessimistic scenario) / 127 436 (optimistic scenario) if Model 1 is used for projections or to 239 620 (pessimistic scenario) / 209 538 (optimistic scenario) if Model 2 is used.

[22] When using the model without FM dummy numbers increase to 0.5 mln immigrants if both sending and receiving countries specific effects are included.

Legal introduction of free movement of workers in 2011 will not lead to substantial jump in the number of immigrants. In all model specifications used the free movement dummy was statistically insignificant. Interestingly, when controlling for both sending and receiving countries fixed effects the model predicts a decline in immigration after free movement is introduced (however, this should be taken with caution due to possible bias in Model 2). The results seem to indicate that if income convergence is likely (due to, say, trade liberalisation, openness to foreign direct investment, structural funds from the EU and remmittances back home), the migration from CEECs would be modest, even after introduction of a free movement provision. When evaluating the expected costs and benefits of moving West it might be worth for a representative migrant to "wait and see", where the option to postpone migration has a positive value if there is uncertainty about future wage gaps. Figure 2 shows projected inflows of immigrants from the CEECs after accession.

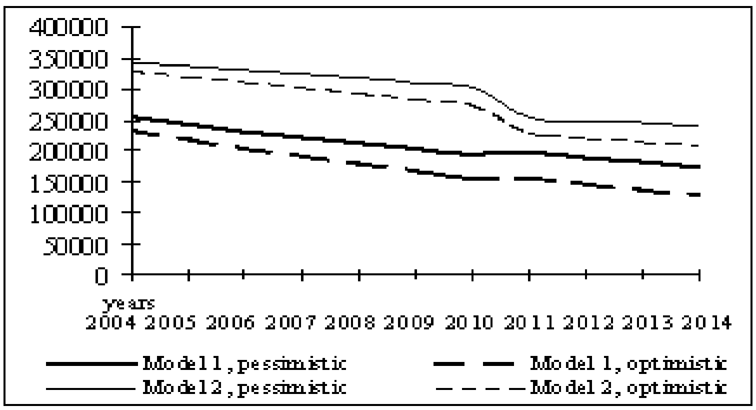

Figure 2: Projected annual inflows of residents from CEECs into the EU. Note: EU countries exclude Luxembourg and Ireland due to data scarcity.

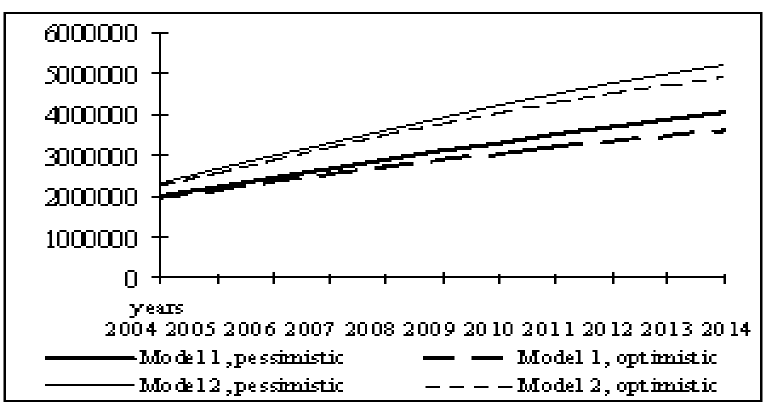

Figure 3: Evolution of the stock of residents from CEECs in the EU. Note: EU countries exclude Luxembourg and Ireland due to data scarcity.

Finally, evolution of stocks of immigrants from CEECs in the EU is presented in Figure 3. As can be seen, Model 1 predicts that depending upon GDP growth scenario within a decade after

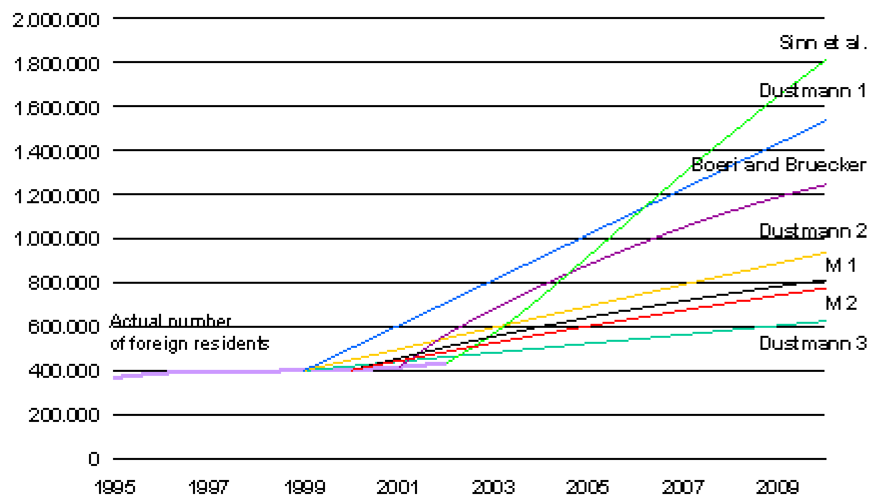

Figure 4: Comparison with other studies: Stock of CEEC8 residents in Germany. Source: EBRD (2003) and author's modifications. Notes: CEEC8 include eight accession countries without Cyprus and Malta. M1-Model 1, M2-Model 2. Results for pessimistic GDP growth scenario only are represented here. Dustmann 1, 2, 3 - stand for Baseline 01, Economic 01 and Economic 04 scenarios in Dustmann (2003).

eastern enlargement around 3.5-4 mln. CEECs citizens will reside in the EU, which constitutes 3-4% of the CEECs population and 1% of the EU population; and Model 2 suggests higher projections: around 5 mln. CEECs citizens within a decade, which constitutes 5% of the CEECs population and around 1.4 % of the EU population. Thus, under above-mentioned assumptions, immigration of about 3.5-5 million people can be expected in a time period from 2004 to 2014. In any case this corresponds to 1-1.4% of the population of the current EU member states. These figures depend on the development of income convergence, extrapolations assumptions and estimation technique used.

Figure 5 compares my results with some other studies and Figure 6 - with two studies that explicitly model country-specific fixed effects. Projections presented here are among studies that predict modest immigration and seem to be consistent with studies that model fixed effects.[23]

[23] EBRD (2003, 96) also concludes that eastern enlargement should not lead to mass migration to the EU, despite large income differentials. The Economist (2004, 25) concludes that "recent academic simulations have predicted that as many as 3 - 4million people will migrate from central to western Europe in the 25 years after enlargement, about 1% of the present EU population".

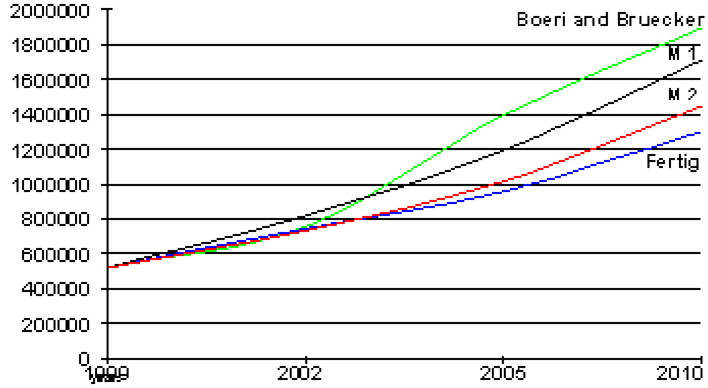

Figure 5: Comaprison with other studies (Models with explicit fixed effects): Stock of CEEC10 residents in Germany. Source: author's calculations. Notes: CEEC10 include eight accession countries plus Bulgaria and Romania. M1 - Model 1, M2- Model 2. Results for pessimistic GDP growth scenario only are represented here.

5 Conclusions

By taking advantage of both time-series and cross-country variation in a panel dataset, this paper estimates the likely magnitude of immigration from eight accession countries as well as Bulgaria and Romania into the EU member states. I have estimated a migration function using the southern enlargement experience and controlling for receiving and sending countries-specific time-invariant effects, as well as estimating these effects explicitly in the auxiliary regression in order to use them for projections. It was found that, while current aggregate immigration flows from the ten CEECs are around 0.3 million persons, the estimated results suggest 0.3 to 0.5 million persons after enlargement depending on the model specification employed. Immigration will decline in the future as convergence of incomes will occur and a cumulated migration of about 3.5-5 million people can be expected in a time period from 2004 to 2014, which constitutes 3-5% of the CEECs population and roughly 1% of the current EU member states' population. In all model specifications used the majority of migrants is predicted to come from Romania, Poland and Bulgaria and into Germany, Austria, Italy and the UK, and introduction of free movement will not increase immigration significantly.

However, it should be kept in mind that such estimations depend upon assumptions made and have many drawbacks. In addition to common for this sort of analysis problems of data reliability, relevance of southern enlargement as a reference scenario, restriction of equal slope coefficients across countries, Lucas critique and endogeneity, coefficients in Model 2 are very likely to be imprecise because of multicollinearity and small variation in the data. The assumptions for extrapolations are also restrictive, one could change some of these assumptions and check the robustness of the results. The dynamic panel data analysis with lagged dependent variable using Arrelano-Bond GMM estimator could also be carried out.

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7 Appendix

7.1 Simple model of migration

This appendix provides a simple estimable model with microfoundations, in which migration is viewed as investment in human capital. The model draws on Hatton (1995), Hatton and Williamson (1998), Clark et al (2002) and Mitchell and Pain (2003). The model explicitly incorporates uncertainty into the migration decision and accounts for the formation of expectations about future income streams based on past information. Suppose that the probability of migration of individual i (i=1,...,n) from the home country (h) to the foreign country (f) in a given year depends on the difference in expected utility streams in the two locations, minus the costs of migration (z_i). Denote this difference by d_i :

$$d_i = EU(y_f) - EU(y_h) + z_i, \tag{10}$$

where y is income. The utility function is assumed to be concave and, specifically, given by u(y)=ln(y). Hence:

$$d_i = E\ln(y_f) - E\ln(y_h) + z_i \tag{11}$$

Expanding Eln(y_f) around E(y_f) using a second-order Taylor series expansion gives:

$$Eln(y_f) = \ln(Ey_f) + \frac{E(y_f - Ey_f)}{Ey_f} - \frac{E(y_f - Ey_f)^2}{2(Ey_f)^2} = \ln(Ey_f) - \frac{Var(y_f)}{2(Ey_f)^2} \tag{12}$$

Assuming that all incomes are derived from employment and following Todaro (1969), denote Ey=we, the real wage times the probability of employment, which is the function of employment rate (or 1 minus the unemployment rate). Also, assume that the uncertainty in y is due to the uncertain prospects about employment (e) rather than the wages (w). Then employment probabilities can be characterised as following a binomial distribution with expected value e and variance e(1-e). Hence:

$$Eln(y_f) = \ln(Ey_f) - \frac{1}{2}\frac{w_f^2 e_f(1-e_f)}{w_f^2 e_f^2} = \ln(Ey_f) - \frac{1}{2}\frac{(1-e_f)}{e_f} \approx \ln(Ey_f) + \frac{1}{2}\ln(e_f) \tag{13}$$

So expected incomes can be expressed as:

$$Eln(y_f) = \ln(w_f) + \ln(e_f) + \frac{1}{2}\ln(e_f) = \ln(w_f) + \frac{3}{2}\ln(e_f) \tag{14}$$

Uncertainty about employment abroad represented by the variance term leads to a greater weight on the employment rate than wages. Staying at home would typically involve less uncertainty (if the individual has relatively secure employment). Hence, expected utility from income at home can be written as:

$$Eln(y_h) = \ln(w_h) + \frac{3}{2}\gamma\ln(e_h), \gamma < 1 \tag{15}$$

Substituting (14) and (15) into (10) gives:

$$d_i = \ln(w_f) + \frac{3}{2}\ln(e_f) - \ln(w_h) - \frac{3}{2}\gamma\ln(e_h) + z_i \tag{16}$$

The decision to migrate depends not just on current utility but also on future values of the stream of expected utility at home and abroad. To account for inter-temporal dimension, denote the expectation at time t of the net present value (NPV) of the difference in expected utility streams from (t+1) onwards by d_{it}^*.Then the NPV of moving today is $d_{it}^* + d_{it}$. Thus the individual probability of migrating at time t is:

$$Pr(m_{it} = 1) = \Pr(d_{it}^* + d_{it}) > 0 \cap d_{it} > 0) \tag{17}$$

Aggregating over all individuals, the aggregate emigration rate, M_t can be written as:

$$M_t = \beta(d_t^* + \alpha d_t) \tag{18}$$

where β measures the impact of the difference in utility streams on the aggregate migration rate (the slope of the emigration function) and α reflects the extra weight given to current conditions, given that potential migrants could choose to wait if $d_{it} < 0$. This condition postulates that, even though the NPV of migrating this year may be positive, it may be even higher next year. In this case potential migrants have an option value of waiting. For simplicity reasons, assuming that probability of individual i migrating at time t depends on d_{it}^*, rewrite (17) as:

$$Pr(m_{it} = 1) = \Pr(d_{it}^* > 0) \tag{19}$$

Then aggregate emigration rate is given by:

$$M_t = \beta d_t^* \tag{20}$$

Now, assume that expectations about future utility are formed by a geometric series of past values of d_t, such that:

$$d_t^* = \lambda d_t + \lambda^2 d_{t-1} + \lambda^3 d_{t-2} + \lambda^4 d_{t-3} + ...$$

Applying Koyck transformation (transforming AR process into MA process) gives:

$$M_t = (1-\lambda)d_t + \lambda M_{t-1} \tag{21}$$

Assume that $\overline{z}$, the mean of z_i over all individuals, is determined by the stock of previous emigrants (network effect) and by a time trend (to proxy for the fall in emigration costs):

$$\overline{z_t} = \varepsilon_0 + \varepsilon_1 MST_t + \varepsilon_2 t \tag{22}$$

where MST is the stock of migrants from h at the beginning of t and t is deterministic linear trend. From equations (16), (20), (21) and (22), the following representation of emigration rates emerges:

$$\begin{aligned} M_t \quad = \quad & (1-\lambda)\beta \ln(\frac{w_f}{w_h})_t + (1-\lambda)\beta\frac{3}{2}\ln(e_f)_t - (1-\lambda)\beta\gamma\frac{3}{2}\ln(e_h)_t \\ & +(1-\lambda)\beta\varepsilon_0 + (1-\lambda)\beta\varepsilon_1 MST_t + (1-\lambda)\beta\varepsilon_2 t + \lambda\beta M_{t-1} \end{aligned} \tag{23}$$

The migration rate is a function of relative wages and relative (un)employment rates in the host and home countries, the existing stock of migrants, the lagged migration rate and a time trend.

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