Immigration to the European Union from its Neighborhoods: Testing Welfare-Chasing and Related Hypotheses by Spatial Gravity

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1. Introduction

The ENP (European Neighborhood Policy) is an experiment in stabilizing the European Union's eastern and southern perimeter. Its aim is to institutionalize economic, political and social relations between the EU countries and their neighbors in the areas of trade, investment, immigration, and political and legislative co-operation. EU 'neighbors' can be divided into countries with accession agreements still to be implemented, countries anticipating accession, and countries without any prospects of EU membership. The ENP is directed at the latter group. It signals the maximum level of integration to which they can aspire on the one hand and a slew of benefits (such as removal of trade barriers, political co-operation, participation in EU programs, cultural, scientific and environmental agreements, legislative harmonization) on the other.

Migration is an issue high on the ENP agenda and has been has been articulated in various agreements such as the Amsterdam Treaty and the Tampere, Hague and Stockholm Programs. While the last EU enlargement saw the EU population grow larger and younger, the EU27 is still characterized by an ageing demographic structure, decreasing fertility rates and increasing life expectancy. In contrast, the demographics of the EN countries point to a much younger age structure and a short term labor force growth rate of 3-5 percent per year (Martin 2009). Due to demographic pressures in the EN countries and ageing in the EU, international migration is the main source of population growth in Europe. The new member states are an obvious source of this growth, and the EN is an increasingly important force. The EU is the destination choice of 78 percent of East Europeans, 79 percent of Middle East migrants and 93 percent of North Africans. Of the estimated 23 million non-EU migrants within the EU, some 9.3m (40 percent) are from the EN. Of these, over 70 percent originate from the southern EN countries (including Turkey) and 29 percent come from the eastern EN states (including Russia) (Fargues 2013).

EN immigration policy is part of an EU attempt to regulate border security in three areas: illegal (or irregular) immigration, combating trafficking and smuggling of human beings, and cross-border management practice. Ostensibly, regulated migration policy is perceived as benefiting both EN and EU countries over the short term. For the former, migration is a ‘safety valve’ solution for the lack of local employment opportunities. Labor migration can reduce domestic unemployment pressures, upgrade the human capital base of return migrants and secure remittances in order to finance development at home. For the EU countries, it provides a short run solution to its demographic imbalance and ageing population, reducing inflationary wage pressure, increasing labor market mobility and boosting growth. Thus potentially, migration policy can be conceived as diverting human hardship in the EN and promoting growth and prosperity in the EU. Over the longer term, things are less clear cut. For the EU countries, using EN migration to match the demand-supply shortfall is only feasible in the context of sustained economic growth. Given the recessionary environment in the EU since 2008-9 this is currently unrealistic. For the EN unregulated migration can simply exacerbate the north-south divide in Europe hindering the chances of domestic structural economic and labor market reform.

In this paper we focus on the determinants of immigration from EN countries to the EU over the period 2000-2010. The EU is also a popular migration destination for other (non EN) countries of origins such as the new EU member states (Romania, Bulgaria) and the EU accession candidates (Iceland, Serbia, Turkey). However for these countries, some of the issues of welfare-chasing and enforcement that are highly pertinent for EN countries are less so for their new member competitors for whom freedom of movement comes with EU membership. The economic crisis of the last few years however, has served to qualify this situation and following EU enlargement, restrictions on labor movement have been intermittently introduced by many of the EU15 core states with respect to new members.

Our particular concern with EN countries limits the scope of our study to cross-section data for 2000 – 2010 during which annual panel data are not available. De Giorgi and Pellizzari (2009) and Bertoli and Fernandez-Huertas Moraga (2013) have used annual panel data to study international migration which enables the identification of time invariant determinants of migration by fixed effects. Since the data we use are decadal from the 1960s it was in principle possible to use panel data econometrics in which the units of time are decades rather than years. Since it was only possible to obtain reliable data on key covariates for 2000 – 2010, the study uses cross-section data.

Bertoli and Fernandez-Huertas Moraga (2013) broke new ground by allowing for cross-section dependence between the panel units. Following Pesaran (2006) they specify a common factor model that relates pairwise migrations from origins to destinations. Specifically, pair-wise migration depends on total migration during period t from all origins, and the average cross-section values during period t of the covariates in the migration model. The sensitivity or factor loadings with respect to these time-series factors are assumed to vary by origin and destinations. In this way pairwise migrations depend on third country effects. Third country effects are a major focus in the present study. Pesaran's estimator is only feasible in panel data, and in any case circumscribes cross-section dependence to a common factor structure. We suggest that third country effects can be specified in cross-section data by using spatial econometric concepts. This approach serves as a methodological alternative to Bertoli and Fernandez-Huertas Moraga (2012) who specify multilateral resistance through origin-nest dummies chosen to eliminate spatial autocorrelation. Indeed, apart from the focus on emigration from EN countries to EU countries, a methodological contribution involves the identification of spatial dynamics in origins and destinations.

The paper proceeds as follows. Section 2 reviews the literature relating to the determinants of migration to the EU with special reference to positive selection and welfare-chasing motives. The methodology used is described in section 3. This involves estimating gravity models for immigration from EN and other origins to EU14[1] destinations. The methodology is both multilateral and spatial. It is multilateral because we do not assume that immigration from the EN to EU14 is independent of immigration from other geopolitical blocs including the EU enlargement countries such as Poland, the EU accession countries such as Turkey, and the rest of the world. For example, immigrants from the rest of the world might crowd-out immigrants from the EN. It is spatial because immigration from origins to destinations might not be independent of what is happening in the vicinities of the origins and in the vicinities of the destinations. In section 4 we describe the variables used and the limitations imposed by the available data. We focus particularly on statistical measures of generosity in the provision of social

[1] EU14 relates to the core EU15 with the exception of Portugal. See Section 4.1 and note 4 for further details

welfare that might induce welfare-motivated migration, and on measures of policy enforcement to deter irregular immigration. Section 5 discusses the empirical results and presents gravity models for immigration from EN and other origins into EU14 destinations using standard, non-spatial econometrics, as well as spatial econometrics for single and double spatial dynamics.

2. Determinants of Migration to the EU

The determinants of immigration can be broadly grouped into three classes (Hooghe, Trappers, Meuleman and Reeskens 2008). Economic and labor based theories posit that income and employment differences between origin and destination are likely to motivate immigration. If immigrants are positively selected (Borjas 1987) they are likely to earn more where wage inequality is greater, in which case they will be attracted by countries in which there is more wage inequality. Cultural and linguistic explanations put weight on the ability of immigrants to acculturate (Chiswick and Miller 1992, 2003, Dustmann and van Soest 2002). Finally, networks explanation attaches importance to the role of social ties, chain effects and familial linkages in promoting immigration (Munshi 2003, Patel and Vella 2012, Pedersen, Pytlikova and Smith 2008). Within these broad groupings the relative weights of pull factors at the destination and push factors at the origin is an empirical issue.

The focus on wage differentials in immigration dates back to Hicks (1932) and Sjaastad (1962). However, the recent focus on welfare-chasing has a more historic pedigree. Following the Elizabethan Poor Laws (1601) levels of relief were set by the parishes. To prevent welfare-chasing from less generous parishes to more generous parishes the Law of Settlements required paupers to obtain relief in their own parish. In his *Wealth of Nations* Adam Smith (1776) observed with disapproval that the Law of Settlements generated artificial wage differentials between parishes because it inhibited labor mobility, and called for their repeal[2]. Contemporary empirical evidence in favor of this hypothesis has been found for the EU (Péridy 2006, De Giorgi and Pellizzari 2009, Docquier and Marfouk 2006 and Razin et al 2011).

[2] "There is scarce a poor man in England of fourty years of age…who has not in some part of his life felt himself most cruelly oppressed by this ill-contrived law of settlements" (Smith 1776, Vol 1 p.124).

The factors driving migration flows to the EU have been investigated extensively. Much of the earlier literature is reviewed by Kahanec (2013). With successive rounds of EU enlargement, recent studies have tended to focus on the role of immigration policies in shaping migration flows to the EU and whether any real EU immigration policy can be identified (Wesselink and Boschma 2011). Mayda (2010) and Ortega and Peri (2012) have looked at the elasticity of immigration with respect to income in destinations and the relationship between this and temporal differences in enforcement of immigration policy (periods of tightness and laxity in policy implementation).

Theory suggests that having born the significant costs of migrating, immigrants will tend to cluster in places offering the most attracting welfare benefits (Borjas 1999). Higher skilled immigrants will tend shun these locations in order to avoid having to pay for this benevolence. Empirical evidence of the existence of welfare magnetism in Europe is mixed. Pedersen et al (2008) examine the welfare generosity hypothesis with respect to 26 OECD countries over the period 1990-2000. They observe immigration from 129 origin countries and find evidence of welfare-chasing between richer countries but not from poorer ones. However, given their heterogeneous and unbalanced panel and the lack of uniformity in the sources of migrations statistics they use, it is hard to draw implications form this study to the case of the EU.

De Giorgi and Pellizzari (2009) use exclusively European data from the European Community Household Panel 1994 - 2001. They estimate the likelihood of moving to countries with more generous welfare and use both an indirect indicator of generosity, the replacement ratio (the ratio of unemployment benefits to the average wage) and a direct measure (public expenditure on unemployment benefits). Their findings support the welfare magnet hypothesis although they find that size of the magnetic force is generally small compared to other conventional labor market indicators such as wage levels and unemployment rates. This suggests that the main issue with welfare chasing may not be its magnitude but the extent to which welfare institutions across the EU countries distort migration flows. Guilietti et al (2013) similarly use welfare spending to unravel the causality between immigration and welfare generosity. To deal with potential endogeneity in this relationship they instrument benefits by the number of political parties in the national coalition (more parties make for more social pressure for higher welfare spending). This reduces the size of the welfare-chasing effect. As in other studies, the limitations of their data constrained the generality of their findings. While they find no significant support for welfare-chasing, absence of information on migrants' place of origin means that they cannot exclude the possibility that benefits act as a magnet for certain origins.

The determinants of immigration from EN countries to the EU are unlikely to differ from those governing immigration from the EU13 (new EU members) to the EU15. Research on EU- bound immigration has in the main focused on a particular destination country or group of countries for a specific time period and type of immigrant. Invariably these studies look at the bilateral immigration from origins to destinations in a push-pull framework. Most studies use panel data with fixed effects which account for unobserved push and pull factors hypothesized to be constant. However, there are various limitations associated with this approach. First, the effect of variables such as language or distance that are fixed are not identified because they are perfectly correlated with fixed effects. Secondly, panel data econometrics assumes that the panel units are independent. For example, it assumes that immigration from Ukraine to France is independent of immigration from Ukraine to Germany, or from Poland to France. Conventional panel data econometrics makes very strong assumptions; it assumes that migration decisions are strictly pair-wise. Third, the panel data are typically not global; they refer to a limited number of origins and destinations. This means that immigration between the included countries is assumed to be independent of immigration from the excluded countries. Since immigration is multilateral rather than bilateral this makes little sense.

Due to their geographical heterogeneity there is no study that looks at the EN countries as a single origin. Rather there are disparate research efforts that take regional blocs of countries and look at the factors affecting immigration to the EU. For example, Kahanec, Zimmerman, Kurekova and Biavaschi (2013) study six countries from the eastern perimeter of the EN; Armenia, Azerbaijan, Belarus, Georgia, Moldava and Ukraine. They show that migrants in general do not adversely affect native wages or employment, and suggest migrant workers are complements rather than substitutes to native workers. They also find that EN immigrants do not have higher welfare take-up rates than other immigrants.

Lorce and De Arce (2008) study bilateral EU-bound migration from another subset of EN countries that include some of the largest members of the former Southern Mediterranean Partnership, namely Algeria, Egypt, Morocco, Tunisia and Turkey. They make the standard gravity assumption of bilateral independence and use dynamic panel estimation with fixed effects to explain the determinants of immigration during 1995-2005. Over this period, Germany France and Spain serve as the destination for over 75 percent of immigrants. On the ‘pull’ side, they find the income inequality and network effects induce immigration while language and distance are less important. Additionally they identify a ‘migratory potential’ effect on the ‘push’ side which captures the extent to which people are constrained to immigrate given the demographic characteristics of their native country (low level labor demand) and its capacity to absorb them.

Cignana and Sulis (2013) test the welfare-chasing hypothesis for a group of 9 EU countries. They estimate a gravity model (with bilateral independence) using panel data during 1990-2005. A welfare package consisting of unemployment benefits, minimum wage and union bargaining agreements should affect labor markets with respect to both prices (wages) and quantities (employment) and change the relative costs and benefits of migration. They also test for complementarity / substitution between welfare motivated migration and immigration policy. They find that stricter migration policies are inversely related to immigration. GDP per capita has a large and direct effect for destinations but no significant effect for origins. In terms of welfare-chasing, they show that employment protection and minimum wages have positive effects on immigration while union power and unemployment benefits have less effect. In testing for interaction between immigration policy and welfare their findings show that the positive effect attributed to welfare inducements is higher in countries where immigration policy enforcement is lower. Comparing the EN countries with other origin countries, they find that the negative effect of GDP is stronger in the former than the latter. Dividing the EN countries into a North African group (Morocco, Algeria, Tunisia, Libya and Egypt) versus the rest (Eastern Europe and Middle East), they identify a strong negative effect of GDP in the origins for the rest of the EN, but no significant effects for North African EN countries. In addition, the negative effect of immigration policies on immigration is shown to be stronger for EN immigrants from East Europe and the Middle East than for immigrants from North Africa. This could be related to skill levels; 33 percent of migrants from the former are skilled while for North Africa the share is only 25 percent. They interpret this as indicating that migrants from East Europe and the Middle East only decide to migrate when their prospects at home are meager. The propensity to migrate for North Africans at a commensurate skill level is much higher.

3. Methodology

3.1 Bilateral Gravity

We estimate the determinants of EN- EU migration using a spatial variant of the gravity model.. The spatial econometrics of this model have been discussed elsewhere (LeSage and Pace 2008, Beenstock and Felsenstein 2014), and are briefly outlined here. In its most basic form, the gravity model posits that bilateral transactions, such as immigration, between N_O origins and N_D destinations vary directly with pull factors in the destinations and push factors in the origins, and inversely with the distance between them. If y_{od} denotes emigration from origin o to destination d, the gravity model is:

$$y_{od} = \alpha + \delta c_{od} + X_o \beta^O + X_d \beta^D + u_{od} \qquad (1)$$

$$E(u_{od} u_{od'}) = E(u_{od} u_{o'd}) = 0 \qquad (2)$$

where X_o denotes a K_O - vector of push variables in origin o with elements x_{ko} , X_d denotes a K_D -vector of pull variables in destination d with elements x_{kd}, and c_{od} represents the distance between o and d. There are $N = N_O N_D$ one-way emigration flows. Equation (2) makes the standard OLS assumption that the residuals are independent between alternative origins (denoted by o`) and alternative destinations (denoted by d`), i.e. the residuals are not spatially autocorrelated in origins and destinations..

If emigrants regard geographically closer destinations as closer substitutes than more remote destinations, the residuals are expected to be negatively spatially autocorrelated among destinations. For example, if more emigrants choose Germany, less are likely to emigrate to neighboring France. The residuals may be positively spatially autocorrelated among origins. For example, if more Moroccans emigrate to France, so might more Algerians emigrate to France. This might be induced by common omitted variables in X_o or it might be induced by spillover effects, i.e. Moroccans and Algerians are mutually influential.

3.2 Spatial Gravity

Let W^O be an N_OxN_O matrix of spatial weights between origins with elements $w^O_{oo`}$, and $W^D$ be its $N_D$x$N_D$ counterpart among destinations with elements $w^D_{dd`}$. These matrices are row-summed to 1 and have zeros along their leading diagonals. The spatial gravity model is:

$$y_{od} = \alpha + \delta c_{od} + X_o \beta^O + X_d \beta^D + \tilde{X}_o \gamma^O + \tilde{X}_d \gamma^D + \rho_O \tilde{y}^O_{od} + \rho_D \tilde{y}^D_{od} + u_{od} \tag{3}$$

$$\tilde{x}_{ko} = \sum_{o' \neq o}^{N_O} w^O_{oo'} x_{ko'}, \qquad \tilde{x}_{kd} = \sum_{d' \neq d}^{N_D} w^D_{dd'} x_{kd'} \qquad \tilde{y}^O_{od} = \sum_{o' \neq o}^{N_O} w^O_{oo'} y_{o'd} \qquad \tilde{y}^D_{od} = \sum_{d' \neq d}^{N_D} w^D_{dd'}$$

$$E(u_{od} u_{od'}) = E(u_{od} u_{o'd}) = 0 \tag{4}$$

where spatial variables are labeled with tildes. For example, $\tilde{x}_{ko}$ denotes the value of x_k among the neighbors of origin o, $\tilde{y}^O_{od}$ denotes emigration to destination d from the neighbors of origin o, and $\tilde{y}^D_{od}$ denotes emigration from origin o to the neighbors of destination d. The vectors γ^O and γ^D are so-called spatial Durbin parameters, and the parameters ρ_O and ρ_D are spatial autoregressive (SAR) coefficients distinguished by origins and destinations. Equation (4) makes the assumption that the residuals of the spatial gravity model are spatially uncorrelated in origins and destinations provided the spatial dynamics are correctly specified.

The direct effects of the push and pull variables in origins and destination on emigration from origin o to destination d are equal to β^O and β^D respectively. However, indirect effects are induced by the specification of spatial dynamics. Since each origin is its neighbors' neighbor, and each destination is its neighbors' neighbor, the total effect of push factors in origin o and pull factors in destination d on emigration from o to d is different to the direct effect since the latter ignores the effect of push and pull factors on third countries.

To obtain these total effects equation (3) is vectorized:

$$y = i_{N_O} \otimes \alpha + \delta c + i_{N_D} \otimes X^O \beta^O + i_{N_D} \otimes W^O X^O \gamma^O + X^D \beta^D \otimes i_{N_O} + W^D X^D \gamma^D \otimes i_{N_O}$$
$$+ \rho_O \Omega y + \rho_D D y + u \quad (5)$$
$$\Omega = \mathrm{I}_{N_D} \otimes W^O$$
$$D = W^D \otimes \mathrm{I}_{N_O}$$

where y is an $N = N_D N_O$ vector stacked as in panel data by origins to all destinations with elements y_{od}, X^O and X^D are $N_O x K_O$ and $N_D x K_D$ matrices respectively of the push and pull variables, and Ω and D are NxN matrices. Solving equation (5) for y gives:

$$y = \Theta[i_{N_O} \otimes \alpha + \delta c + i_{N_D} \otimes X^O \beta^O + i_{N_D} \otimes W^O X^O \gamma^O + X^D \beta^D \otimes i_{N_O} + W^D X^D \gamma^D \otimes i_{N_O} + u] \qquad (6)$$
$$\Theta = \left(\mathrm{I}_N - \rho_O \Omega - \rho_D D\right)^{-1}$$

The N^2 elements of Θ are $\theta_{od.o`d`}$. From equation (6) the total effects of the push and pull variables in origins and destinations on emigration from origin o to destination d are:

$$\frac{\partial y_{od}}{\partial x_{ko'}} = [\beta_k^O + \gamma_k^O w_{oo'}^O] \sum_{o' \neq o}^{N_O} \theta_{od.o'd} \qquad (7a)$$
$$\frac{\partial y_{od}}{\partial x_{kd'}} = [\beta_k^D + \gamma_k^D w_{d'o}^D] \sum_{d' \neq d}^{N_D} \theta_{od.od'} \qquad (7b)$$

Equation (7a) refers to the effect of x_k in origin o` on immigration from o to d. To obtain the partial derivative for the effect of $x_k$ in origin o itself simply substitute o = o`. Equation (7b) refers to the effect of x_k in destination d` on immigration from o to d. To obtain the partial derivative for the effect of $x_k$ in origin d itself simply substitute d = d`. These partial derivatives vary directly with the direct effect (β^O and β^D), the spatial Durbin effect (γ^O and γ^D) and spatial propagation ($\theta_{od.o`d`}$). Note that in the absence of spatial dynamics equations (7) revert to the direct effects since in this case $\Theta^{-1} = I_N$. These total effects, which are calculated in section 5, are multilateral because in general emigration from o to d depends on the push and pull factors in all origins and in all destinations.

3.3 Levels and Differences of Push and Pull Variables

Let F_{od} denote the foreign-born from origin o in destination d. Ignoring secondary emigration and mortality $y_{od} = \Delta F_{od}$. Sjaasted (1962) suggested that emigration is the outcome of a partial adjustment model in which the equilibrium number of foreign-born depends on the levels of pull factors in the destinations (Z_d) and the levels of push factors in the origins (Z_o). For example, the equilibrium number of foreign-born varies directly with income in destinations and inversely with income in origins. This means that in equilibrium income differentials between origins and destinations may persist. The equilibrium number of foreign-born is hypothesized to be:

$$F^*_{od} = a + bZ_d - cZ_o \qquad (8)$$

The partial adjustment model is:

$$y_{od} = \lambda(F^*_{od} - F_{od}) + \mu\Delta F^*_{od} \qquad (9)$$

where positive fractions λ and μ are partial adjustment parameters. Substituting equation (8) into (9) gives:

$$y_{od} = \lambda a + \lambda bZ_d - \lambda cZ_o + \mu b\Delta Z_d - \mu c\Delta Z_o - \lambda F_{od} \qquad (10).$$

According to equation (10) emigration depends in general on the levels and changes of the push and pull variables. Therefore, X^O and X^D in the spatial gravity model (equation 5) include levels and changes in push and pull variables.

Most studies, including those reviewed in section 2, relate immigration to levels of push and pull factors alone. This assumes unreasonably that eventually everyone emigrates provided the push and pull factors do not change. Alternatively it means that b and c are infinitely large. By contrast, equation (10) ensures that eventually a finite number (F^*_{od}) emigrate because b and c are finite.

3.4 Exogeneity of Push and Pull Variables

X^O and X^D are assumed to be independent of the gravity residuals (u), i.e. they are exogenous. If emigration from o to d induces changes in these variables they will not be exogenous. For example, if immigration affects native wages, destination income will be endogenous. The same applies to welfare policy in destinations. Specifying lagged values of X^O and X^D in the case of panel data would only solve the identification problem if these variables are weakly exogenous. They would not be weakly exogenous if the panel residuals are serially correlated. In any case, in cross-section data the specification of lagged values cannot solve the identification problem.

If immigration is large relative to the destination and origin economies the concern with cross-section endogeneity is more important than if it is small. We show below that immigration during the study period was most probably too small to induce identification problems; the tail of immigration was too small to wag the dog. The same applies in the origins where in theory emigration increases wages. Annual rates of emigration are on average about 0.06 percent of origin populations and even smaller proportions of destination populations. Therefore, concerns with reverse causality are unlikely to be serious with the exception of enforcement of immigration policy as discussed in section 5.

3.5 Identification of ρ_O and ρ_D

Since the spatially lagged dependent variables $\tilde{y}_o$ and $\tilde{y}_d$ in equation (5) are jointly determined with y, the parameters ρ_O and ρ_D are not identified and OLS estimates would be biased and inconsistent. For example because immigration from Morocco to Spain depends on immigration from Morocco to France and immigration from Algeria to Spain, there is reverse causality from these spatially lagged dependent variables to y. Identification requires instrumental variables for the spatially lagged dependent variables, or equation (5) must be estimated by maximum likelihood (ML). We choose the latter.

Estimation of equation (5) by ML is not straightforward because the likelihood function involves the determinant $\left|I_N - \rho_O \Omega - \rho_D D\right|$. If $\rho_O = \rho_D$ matters are greatly simplified and the determinant reverts to its standard SAR form involving a single spatial lag, in which case estimators available in Matlab may be used. More generally, the likelihood has to be maximized with respect to ρ_O and ρ_D as well as other parameters in equation (5). For these purposes we use the double spatial lag ML estimator developed by Elhorst, Lacombe and Piras (2012) to estimate these parameters.

4. Data

4.1 The Dependent Variable

We study emigration rates during 2000-2010 from the 15 EN countries to the EU14, which comprise the core EU members up till 1995 with the exclusion of Portugal for which data for foreign-born are small or missing. The EU13 represent all the countries that joined the EU over the period 1995-2007 with the addition of Portugal. The EUF represent future accession countries as of 2010. We also include Russia making 49 countries in all[3].

We restrict the EU destinations to the 14 core countries for two reasons. First, the EU13 were not EU members in 2000 when the study period begins. Second it turns out that there were no immigrants from the EN countries in the EU13. Dropping them conveniently means that we may ignore the problem of treating cases where $y_{od} = 0$. In any case immigrants from EU13 most probably compete with immigrants from EN and elsewhere in EU14 destinations. Therefore, N_O is 35 and N_D is 14.

We use the World Bank's Global Bilateral Migration Database (GBMD) which provides estimates of the number of foreign-born by all origins of the world in all destinations (Ozden et al 2011). Table 1 presents these data in 2000 for 36 origins (including rest of the world) in the 14 destinations. Since GBMD refers to population stocks, we define immigration from origins to destinations by the number of foreign-born in 2010 minus the number in 2000. GBMD in principle covers people who returned to their country of origin by 2010 or migrated to third countries. However, foreign-born who died between 2000 and 2010 would be registered as a decrease in the number of foreign-born. Therefore, our definition of immigration is an under-estimate because GBMD does not identify deceased immigrants.

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[3] **EU14**: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Spain, Sweden and United Kingdom. **EU13**: Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia and Slovenia.**EUF**: Albania, Bosnia and Herzegovina, Croatia, Iceland, Montenegro, Serbia, Macedonia and Turkey. **EN:** Algeria, Armenia, Azerbaijan, Belarus, Egypt, Georgia, Israel, Jordan, Lebanon, Libya, Morocco, Republic of Moldova, Russian Federation, Syrian Arab Republic, Tunisia and Ukraine. There are no data for the Palestinian Authority. Our data relate to the period 2000-2010. Consequently, Croatia (joined the EU in 2012) is categorized as EUF.

This partly explains how immigration (Table 2) is occasionally negative. Immigration from Russia to former Soviet countries (such as the Baltic states) sometimes appears as negative in the data because Russians returned to Russia after the dissolution of the USSR. Finally, there may be data errors in GBMD[4]. Table 2 expresses immigration during the first decade of the 21st century as a percentage of the foreign-born in 2000. Some of these estimated rates of immigration are very large especially in destinations where there were few foreign-born in 2000.

Table 3 Foreign-born & Emigration Rates: EU14

	Foreign-born 2000	Change in Foreign-born 2000-10	Population 2000
EU13	5,986,345	648,486	115,618,927
Applicant	4,552,388	1,671,455	77,109,507
EN	4,799,815	1,477,448	397,250,903
Total	15,338,548	3,797,389	589,979,336

	Emigration Rates %	Rates of Increase (%) in Foreign-born
EU13	0.56	10.83
Applicants	2.17	36.72
EN	0.37	30.78
Total	0.64	24.76

The upper part of Table 3 reports the foreign-born in EU14 in levels and changes for the three main geopolitical groups. The lower part translates these numbers into emigration rates and rates of increase in foreign-born. The highest rates of emigration occurred in the

[4] Note that data for Israel in GBMD differ to data published by Israel's Central Bureau of Statistics. We have been unable to obtain an explanation for this large discrepancy from the World Bank Also, Ozden et al (2011) report census dates for Israel for years in which there was no census.

accession countries and the lowest for the EN countries. On average, emigration rates were 0.64% during the decade and the foreign-born increased by almost a quarter.

4.2 Explanatory Variables

The variables, their data sources and definitions are provided in Appendix 1. As argued in section 3.3 we expect that immigration during period t to t+1 is affected by the initial levels as well as the changes in the push and pull factors in origins and destinations. For example, immigration is hypothesized to vary directly with welfare generosity in 2000, as well as changes in welfare generosity by 2010. The welfare- chasing hypothesis of immigration posits that given everything else, destinations offering more social benefits will be more attractive. Therefore, where the data are available, we test for both level effects as well as changes for all variables. Welfare benefits have not risen uniformly in all 14 destinations (Table 4). Social expenditure has grown mainly in those countries that subsequently became the epicenter of the Eurozone crisis at the end of the decade, namely Greece, Ireland and Italy.

Table 4 Social Expenditure per Head 1990-2010

	1990	2000	2010
Austria	4,592	6,534	8,136
Belgium	5,046	6,323	7,523
Denmark	5,131	6,885	7,959
Finland	3,989	6,220	7,062
France	4,589	6,238	7,442
Germany	4,979	6,148	7,136
Greece	2,148	2,809	4,305
Ireland	2,295	2,907	4,995
Italy	3,860	4,961	6,348
Luxembourg	5,721	8,701	12,737
Netherlands	5,095	5,928	6,214
Spain	2,397	3,823	4,762
Sweden	6,073	7,646	8,731
UK	3,340	4,303	5,625

* decade average, constant prices (2000) and constant PPPs (2000), in US dollars

In gravity models, immigration is assumed to depend on GDP per head in origins and destinations, as well as measures of cultural and ethnic difference. For example, if o and d share a common language immigration from o to d is likely to be greater. Also, immigration is hypothesized to vary inversely with the geographical distance between o and d. As noted earlier, immigrants are attracted by wage dispersion and therefore immigration should vary directly with the income inequality at destinations. Out of the 14 destination countries, inequality increased in half of them, remained unchanged in three and decreased in four countries (Table 5). Countries suffering economic stress over this period have the highest levels of inequality, namely Greece, Ireland, Spain, Italy and the UK.

Table 5 Income Inequality in EU14

	Gini	
	2000	2010
Austria	0.238	0.265
Belgium	0.287	0.271
Denmark	0.215	0.232
Finland	0.218	0.254
France	0.277	0.288
Germany	0.266	0.285
Greece	0.336	0.321
Ireland	0.324	0.324
Italy	0.348	0.352
Luxembourg	0.259	0.258
Netherlands	0.297	0.284
Spain	0.343	0.319
Sweden	0.211	0.234
UK	0.336	0.331

Finally immigration policy and the extent of its enforcement are expected to be inversely related to immigration. We use data on removals (expulsions) and apprehensions to calculate expulsion and apprehension rates (in terms of the population at risk) in EU destinations (Table 6). These rates are of the order of one percent except in Greece where they approach 30 percent[5]. Refusal of entry may be a deterrent for subsequent illegal immigration and those destinations with highest rates of refusal such as Austria and Finland have correspondingly low expulsion and apprehension rates.

Table 6 Enforcement of Immigration Policy

	Refusal*	Apprehension*	Removal*	Asylum**
Austria	3.77	3.38	1.65	26.2
Belgium	0.51	0.90	0.48	17.3
Denmark	1.06	0.07	0.36	32.5
Finland	2.25	0.01	1.39	31.7
France	0.70	0.45	0.14	11.9
Germany	0.64	1.33	0.62	23.4
Greece	1.3	26.98	28.03	0.9
Ireland	1.43	0	0.02	8.5
Italy	2.13	1.98	0.55	29.3
Luxembourg	0.04	0.12	0.06	31.4
Netherlands	0.60	0.59	2.17	41.4
Spain	0.65	0.57	1.40	4.4
Sweden	0.43	0.84	0.19	33.6
UK	0.63	0.52	0.79	23.8

* 1997-2000 average as % of immigrant stocks in 2000

** 2005-2009 average of % of positive asylum decisions

Finally, although GMDB is available on a decennial basis since 1960, we focus our efforts on the last decade only (2000 - 2010). Had all the covariates, such as welfare generosity, inequality and enforcement been available for earlier decades, it would have been possible in principle to estimate equation (5) using panel data for 5 decades rather than cross-section data. However, we were unable to obtain the necessary data for the

[5] Ideally the apprehension rate should be expressed as a proportion of irregular immigrants, for which data are not available. Therefore, the measured apprehension rate understates the true apprehension rate, which equals 1 + r times the measured rate where r is the unknown ratio of legal to irregular immigrants.

covariates dating back to the 1960s. In any case the estimation of dynamic panel data with spatial dependence constitutes uncharted econometric territory. Therefore, we concentrate our efforts on immigration during the last decade, which is most probably of greater interest to policy makers than immigration in the 1960s and 1970s.

5. Results

We begin by estimating equation (5) by OLS, which ignores spatial dependence within origins and destinations. The baseline specification, which appears in Table 7, is obtained following a specification search in which levels (for 2000) and changes (between 2000 and 2010) of variables discussed in section 4, such as GDP per head in origins and destinations, are specified in an unrestricted model, which subsequently is nested-down using the general-to-particular methodology to the restricted model that features in Table 7. The restricted baseline model is intentionally "lenient" in that it includes covariates with t-statistics below standard levels of statistical significance. These sub-marginal variables have been retained in face of the possibility that in spatial specifications their statistical significance might increase. Therefore, we err on the side of caution in the baseline specification. However, numerous variables such as GDP per head in EU destinations do not appear in the baseline model because they were clearly statistically insignificant.

Thereafter, we estimate equation (5) by maximum likelihood as a regular SAR or single spatial lag model, i.e. with $\rho_O = \rho_D$. Finally, equation (5) is estimated as a double spatial lag model, i.e. with ρ_O and ρ_D estimated separately. For these spatial models it is necessary to set criteria for spatial connectivity (W^O and W^D). We experiment with three criteria; exports, immigration and distance. In the former case, for example, the elements of W^D are defined as:

$$w_{dd'} = \frac{z_{dd'} + z_{d'd}}{\sum_{d' \neq d}^{N_d} z_{dd'} + z_{d'd}}$$

where $z_{dd`}$ refers to exports from destination d to destination d`. Exports between d and d` are expressed relative to d's exports to all countries in its reference group (presently

N_D) plus the exports of d` to d. The denominator ensures that these weights are asymmetric so that if d is trading less with third countries than d`, $w_{dd`}$ is greater than $w_{d`d}$. In the case of distance the weights are symmetric and are defined in terms of the squared inverse of distances.

5.1 OLS: Standard Gravity Model

By using OLS as the baseline model we run the risk of inducing pre-test bias since had the baseline been spatial the restricted model might have contained different covariates to its OLS counterpart. This would imply that OLS and spatial specifications are not necessarily nested. We justify the use of OLS as the baseline for two reasons. First, we think that just as temporal dynamics are unlikely to influence the choice of covariates in time series data, so spatial dynamics should not influence the choice of covariates in spatial cross section data. Indeed, we find that the OLS covariates are spatially robust with respect to spatial misspecification. Second, it is technically easier to conduct specification searches using OLS than it is using SAR models, and especially double spatial lag models which are numerically challenging to estimate.

Table 7 Results: Emigration Rates

Variables	OLS		SAR		SAROD	
Intercept	-0.0653	(-3.15)	-0.0716	(-3.42)	-0.0482	(-2.45)
Log foreign-born	0.00034	(1.69)	0.0003	(1.63)	0.0003	(1.76)
Log GDP/head: origin	-0.0011	(-1.94)	-0.0008	(-1.38)	-0.0012	(-2.38)
Urbanization: dest	9.4E-0.5	(1.3)	0.0001	(1.46)	0.0001	(1.11)
Age 0-19: dest	0.0727	(1.64)	0.0922	(1.90)	0.0526	(1.24)
Ag 65+: dest	0.1893	(3.52)	0.2034	(3.95)	0.1509	(2.95)
Gini: dest	0.05185	(2.44)	0.0544	(2.60)	0.0409	(2.03)
Language	0.0065	(2.65)	0.0066	(2.73)	0.0064	(2.76)
Asylum: dest	0.005	(0.71)	0.0077	(0.71)	0.0044	(0.67)
Unemployment rate: dest	-0.0016	(-3.20)	-0.0019	(4.74)	-0.0013	(2.72)
Growth in soc spending/head: dest	0.0297	(4.06)	0.0228	(2.70)	0.0256	(3.67)
GSS*EN	-0.0084	(-2.01)	0.0021	(1.70)	-0.0084	(-2.12)
Immigration from ROW	0.01	(4.26)	0.011	(4.58)	0.0074	(3.33)
Foreign-born ROW	-0.0038	(-3.53)	-0.004	(-3.78)	-0.0024	(-2.37)
EU applicant	0.0014	(1.21)	-0.0011	(-0.89)	0.0022	(2.01)
rho destination		0	-0.083	(-1.77)	-0.391	(-4.93)
rho origin		0			0.041	(0.72)
lnL	1617		1795		819	

Notes: Dependent variable, rates of emigration from origins: emigration during 2000 – 2010 divided by origin populations in 2000. N = 488. t-statistics in parentheses. Spatial weighting: intra-origin and intra-destination immigration.

The OLS model reported in Table 7 shows that immigrants are deterred by unemployment in EU destinations, and although emigration rates do not depend on income per head in EU14, immigrants are attracted by income inequality in EU14, suggesting that immigrants are positively selected. On the other hand, emigration rates vary inversely with income per head in origins. Immigration does not depend on the level of welfare generosity but it varies directly with changes in generosity. Therefore, cutting welfare generosity as measured by social spending per head reduces immigration, suggesting that some immigrants are also negatively selected. EU countries with ageing populations attract immigrants perhaps because of increased work opportunities for taking care of the elderly. Foreign-born from the rest of the world crowd-out immigrants from the origins, but immigration from the rest of the world crowds-in immigrants from the origins in the study. This suggests that incumbent immigrants from ROW are substitutes for new immigrants from EN and other countries, whereas new immigrants from ROW and EN and other immigrants in the study are complements. Emigration rates vary directly with the number of foreign-born in the destinations. However, this effect is small and is not statistically significant at conventional levels.

Immigration policy, as measured by acceptance rates among asylum seekers, has a positive effect on emigration rates, however, it is not statistically significant. Experiments with other measures of immigration policy came up with "wrong" signs. For example, emigration rates vary directly with enforcement policy as measured by apprehension and removal rates of irregular immigrants, but these effects are not statistically significant. We suspect reverse causality from immigration (enforcement of immigration policy may be more pro-active where immigration is greater) is likely to bias upwards this parameter concealing the true deterrent effect. Common languages encourage immigration but distance (not shown) does not matter. Immigration is higher from the accession countries, but a Chow test reveals (not shown) that the factors driving immigration from EN countries are the same as those affecting other immigrants, except EN immigrants are less sensitive to changes in welfare policy.

5.2 Spatial Gravity

Table 7 also reports two spatial gravity models. The first (SAR) imposes the restriction that $\rho_O = \rho_D$ and is therefore a single spatial lag model. The second (SAROD) is a double spatial lag model in which ρ_O and ρ_D are estimated without restriction. For these purposes we experiment with different spatial weighting criteria including bilateral exports, distances, and immigration. The results reported in Table 7 use the latter. We do not think that this raises methodological difficulties because intra-destination immigration and intra-origin immigration are unlikely to be related to immigration between origins and destinations. For example, emigration from France to Belgium is unlikely to be dependent on emigration from Morocco to France or Belgium. Although the signs and the significance levels of the SAR coefficient depend on the weighting criteria, the likelihoods of these spatial models are similar and exceed their OLS counterpart.

On the whole the means and the variances of the OLS estimates turn out to be robust with respect to the specification of a single spatial lag. The same applies to the double spatial lag model in Table 7 (SAROD) where the means and variances of the parameter estimates are similar to their OLS counterparts. In the SAROD model ρ_D is negative and statistically significant whereas ρ_O is positive but not statistically significant. The former implies spatial substitution in emigration rather than spatial complementarity; e.g. if more immigrants emigrate to France fewer emigrate France's neighbors.

Table 8 Robustness tests for spatial weighting criteria

	SAR		SAROD		
	ρ	lnL	ρ_o	ρ_d	lnL
Distance	0.096 (1.821)	1796	0.161 (2.21)	0.029 (0.323)	810
Exports	-0.026 (-0.503)	1795	0.048 (0.66)	-0.156 (-1.7)	809
Immigrants	-0.083 (-1.773)	1795	0.041 (0.715)	-0.391 (-4.931)	819

* notes: lnL (OLS) = 1617. t-statistics in parentheses. lnL (SAROD) not comparable

Spatial Durbin coefficients (γ^O and γ^D in equation 5) turned out to be statistically insignificant. In the case of welfare spending per head γ^D turned out to be negative, suggesting that welfare generosity adversely affects migration to neighboring destinations. However, this effect was not statistically significant at conventional levels (t – statistic = -1.6).

In Table 7 the spatial weighting matrices W^O and W^D.are based on immigration between origins and between destinations respectively. Table 8 compares these results (reported in the last row) when the spatial weighting matrices are based on distances and exports. The table shows that the results are sensitive to spatial weighting. For example, in the SAROD model the signs of ρ_O and ρ_D are reversed when distance is the criterion. Since the estimated likelihood[6] is largest when immigration is used for spatial weighting we have selected it for presentation in Table 7.

5.3 Size Effects

The SAROD model in Table 7 is used to calculate the effects of the covariates on emigration rates. The direct effects are simply equal to β^O and β^D and are reported in Table 9 as elasticities. For example, if GDP per head in origins increases by 1 percent emigration rates decrease by 0.187 percent, i.e. the average emigration rate would have been 0.6 percent instead of 0.64 percent, which would have reduced the rate of growth of foreign-born by 0.046 percent, i.e. from 24.76 percent to 24 percent.

Table 9 Direct Size Effects (Elasticity: SAROD)

	Emigration Rate (0.64%)	Foreign-born (24.76%)
GDP/head:	-0.187	-0.046
Age 65+: EU14	23.58	5.80
Unemployment rate: EU14	-20.30	-5.00
Soc Spending per	4.00	0.985
Gini	6.39	1.57
Foreign-born	0.047	0.012

If the population aged 65+ in the EU14 increases by one percentage point the emigration rate increase by 23.58 percent from 0.64 percent to 0.85 percent and the rate of growth of foreign-born increases by 5.8 percent. If the Gini coefficient increases by 0.01, the rate of emigration increases by 6.39 percent which increase the rate of growth of foreign-born by 1.57 percent. If the unemployment rate in EU14 increases by 1 percentage point it

[6] Note that lnL for the SAROD models cannot be compared with LnL for the SAR models.

reduces emigration rates 20.3 percent which reduces the growth rate for foreign-born by 5 percent. If the foreign-born increase by 1 percent emigration rates increase by 0.047 percent; the immigrant multiplier is small but not statistically significant.

Finally, if social spending per head increases by 1 percent emigration rates increase by 4 percent which increases the growth rate in foreign-born by 0.985 percent. The effects reported in Table 9 ignore spatial propagation. We use equations (7), which account for spatial propagation, to calculate the total effect of the covariates on emigration rates. For these purposes we calculate the effect of a 1 percent increase in social spending per head in individual destinations on emigration rates from all origins to all destinations. In the absence of spatial dynamics emigration rates would increase by 0.0172 percentage points from EN origins and by 0.0256 percentage points from other origins, while emigration rates to other destinations would not be affected. The mean across all origins is 0.0222 percentage points.

Table 10 reports the effects of spatial propagation induced by an increase in social spending per head of one percent. The direct effect on emigration rates (0.022 percentage points) is the same for all countries The effect on destination refers to the change in emigration rates from all origins to the destination country that increased social spending per capita. The total effect refers to the effect on emigration rates to all destinations taking into account deflection of immigration from other EU destinations. For example, if France alone increases social spending per head the total effect increases emigration rates to France by 0.0229 percentage points, which slightly exceeds the direct effect of 0.022. This increase is induced by positive spatial propagation. However, part of this increase is due to deflection from other destinations. Allowing for deflection immigration to EU destinations as a whole increases by only 0.0116 percentage points, which is considerable less than the direct effect and the effect on France.

Table 10 shows that these spatial effects vary by country. For example, if Germany raises social spending per head emigration rates increase to Germany by 0.0234 percentage points, which exceeds its French counterpart. However, this increase is almost entirely induced by deflection since emigration rates to the EU as a whole (Germany included) increase by only 0.005 percentage points. By contrast, if Austria raises social spending per head the total effect is 0.0214 percentage points, which is almost as large as the direct effect. This happens because Austria is less spatially connected than Germany, which is highly spatially connected.

Table 10 Spatial Propagation

Destinations	Effect on Destination	Total Effect on EU14
Austria	0.0228	0.0214
Belgium	0.0228	0.0172
Denmark	0.0228	0.0203
Finland	0.0236	0.0172
France	0.0229	0.0116
Germany	0.0234	0.0050
Greece	0.0229	0.0198
Ireland	0.0229	0.0205
Italy	0.0232	0.0137
Luxembourg	0.0226	0.0223
Netherlands	0.0228	0.0168
Spain	0.0227	0.0185
Sweden	0.0236	0.0167
United Kingdom	0.0231	0.0042
Average		0.0168

Note: The response of rates of emigration to a 1 percent increase in social spending per head in destinations. The direct effect is 0.022 for all destinations.

If all EU destinations raise social spending per head at the same time the average effect on EU destinations as a whole is 0.0168, which is less than the direct effect due to negative spatial substitution. The whole is less than the sum of its parts. For some destinations such as Italy the increase will be less than 0.0168, while for others such as Luxembourg it will be more.

6. Conclusion

We have used cross-section data during 2000 – 2010 to investigate the determinants of immigration to the EU14 from three main geopolitical groups. These include countries from the European Neighborhood, accession countries or candidates to join the EU, and mainly Eastern European countries which joined the EU during the study period. Apart from income differentials, unemployment rates and other standard variables hypothesized to determine immigration, we have focused attention on welfare-chasing as well as measures to enforce immigration policy. We have also investigated whether tests of these hypotheses are robust with respect to spatial misspecification.

A robust result is that immigration to EU14 countries varies directly with the change in social spending per head. This result stands out in all the models including OLS and spatial models. However, the level of social spending per head does not in itself induce immigration. This means that more generous countries in terms of welfare benevolence do not necessarily attract more immigration. On the other hand, if a given country becomes more benevolent it attracts more immigration, and when it becomes less benevolent it deters immigration. This difference between levels and changes may not have been sufficiently stressed in the literature. Our results suggest that if during 2000 and 2010 social spending per capita increased by one percent in EU14 the emigration rate would increase by 2.6 percent and the immigration rate would increase by 0.65 percent. However, for immigrants from the European Neighborhood these increases are 1.95 percent and 0.5 percent.

A methodological conclusion is that OLS gravity models over-estimate size effects by ignoring spatial substitution. For example, the OLS estimate of the size effect of 2.6 percent mentioned in the previous paragraph and estimated using spatial gravity, is 4 percent. In the present study OLS size effects are biased upwards because they ignore “multilateral resistance” induced by the fact that EU destinations are rivals.

The fact that changes in welfare benevolence matter rather than levels suggests that in 2000 numbers of foreign-born (immigrant stock) were already in equilibrium, and that immigration during 2000 to 2010 was induced by changes in these equilibria. Also, EU membership greatly expanded during this decade underscoring this disturbance.

Another robust result is that immigrants are attracted by economic inequality as measured by the by the Gini coefficient. However, in this case it is the level that matters rather than its change. Moreover, levels and changes of income per capita did not have any significant effect on immigration to the EU14 during 2000 to 2010. These results support the selection model of immigration according to which immigrants are positively selected and seek countries which will provide them with greater compensation for their skills. This is more likely to occur where income dispersion is greater.

We do not find evidence that the threat of apprehension deters migrants from the EN and other countries. We think that this is largely for technical reasons. The ‘stick’ of enforcement measures wielded over the last decade has apparently not been able to counteract the ‘carrot’ embodied in European living standards. Had we been more able to control for the latter, we might have been successful in identifying the deterrence. Also, if countries with more exposure to immigration wield bigger "sticks", their deterrent effect will be concealed through reverse causality.

Finally, the increase in unemployment in EU since 2008 should have had a major effect in reducing immigration from EN and other origins because immigration is very sensitive to the rate of unemployment. Indeed, we expect that emigration rates fell by more than a half because of the European recession.

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Data Appendix: variables, definitions and sources

1.Economic variables

The *GDP/head;origin* and *GDP/head:destination* variables relate to percentage change in country GDP. The data source is the IMF 'World Economic Outlook database'. The IMF calculates the year on year percentage change in country GDP in constant prices. We aggregate this data to create a decade long percentage change. The resultant variable is the decade average of gross domestic product per capita (2009 prices) in origin countries. GDP is deflated to 2009 dollars and the deflated data is then averaged across the immigration decade. For example, the 2010 time covers the average of 2000-2009. *Unemployment rate:destination* is the decade average unemployment rate in destination country. The source is the World Bank 'World Development Indicators' database, where unemployment is defined as: 'the share of the labor force that is without work but available for and seeking employment'. The data is averaged across the immigration decade. For example, unemployment for the 2000 time period is the average of 1990-1999. The *Gini:destination* variable is the decade average Gini coefficient after taxes in destination country. The data source is OECDStat which reports this variable in mid-decadal time frames (eg 'mid-90's', 'mid-2000s, etc.).

2. Welfare Generosity Variables

Growth in social spending/head: destination is the natural log of the lagged decade average public social expenditure in the destination country. The data source is OECDStat that presents expenditure on social programs by countries. We used public expenditure on social issues per head (in constant 2000 PPP USD) and averaged these across the decade. The variable reports the average of the previous decade. For example average public expenditure for the year 2010 the average is of 1990-1999. *Growth in social spending/head: destination* is the percentage change between decade t and t-1 in average social expenditure in destination country. The source is OECDStat data on public expenditure on social issues per head (in constant 2000 PPP USD) . Decadal change is measured as above. *Expenditure primary education:destination* is captured by public expenditure per primary schooling pupil as a % of GDP per capita in destination. The data source is

UNESCO – Institute for Statistics database. Again, we average the data across the relevant immigration decade, for year 2000 the average is for 2000-2009.

3. Enforcement variables

Apprehended relates to the percentage of migrants apprehended from total migration stock in destination country. The data source is the EMN "Annual Report on Migration and International Protection" for the years 2003-2009. Because of limited data span, for 2010 we use average number of apprehended illegal migrants in destination countries 1997-2000, divided by the immigrant stock 2000 (rather than illegal immigrants).

Variable name	Measurement unit	Definition [time period]	Source [Link]
Immigration rate	Fraction	(Stock of persons born in country A living in country B at time t minus stock of persons born in country A living in country B at time t-1)/(Population of country A at time t-1) [t=2010, t-1=2000]	World Bank - Global Bilateral Migration Database [http://data.worldbank.org/data-catalog/global-bilateral-migration-database]
Foreign born	Persons	Natural log of stock of persons born in country A living in country B at time t-1 [t-1=2000]	World Bank - Global Bilateral Migration Database [http://data.worldbank.org/data-catalog/global-bilateral-migration-database]
GDP/head: origin	U.S. Dollars, 2009 prices	Decade average GDP per capita in origin country A [t=2000-2010]	IMF [http://www.imf.org/external/pubs/ft/weo/2012/02/weodata/download.aspx]
Unemployment rate: destination	Percentage	Decade average unemployment rate in destination country B	World Bank - World Development Indicators [http://data.worldbank.org/indicator/SL.UEM.TOTL.ZS]
Growth in social spending/head: destination	Fraction	Percentage change between decade t and t-1 in the decade average social expenditure in destination country B [t=2000-2007, t-1=1990-1999]	OECD Stat [http://stats.oecd.org/]
Primary education expenditure/ head: destination	Percentage	Public expenditure per primary schooling pupil as a % of GDP per capita in destination country B [t=2000-2009]	UNESCO – Institute for Statistics [http://stats.uis.unesco.org/unesco/TableViewer/tableView.aspx?ReportId=3341&IF_Language=eng]

Gini: destination	Index	Decade average Gini coefficient after taxes in destination country B [mid 2000s]	OECD Stat [http://stats.oecd.org/]
Urbanization: destination	Percentage	Share of urban population in destination country B [t=2010]	UNDESA - World Urbanization Prospects, the 2011 Revision [http://esa.un.org/unup/CD-ROM/Urban-Rural-Population.htm]
Aged 0-19: destination	Fraction	Percentage of the population between ages 0-19 in destination country B [t=2010)	UNDESA - World Population Prospects: The 2010 Revision [http://esa.un.org/wpp/Excel-Data/population.htm]
Aged 65+: destination	Fraction	Percentage of the population above the age of 65 in destination country B [t=2010)	UNDESA - World Population Prospects: The 2010 Revision [http://esa.un.org/wpp/Excel-Data/population.htm]
Apprehension rate	Fraction	Percentage of migrants apprehended from the total migration stock in destination country B (interacted with a dummy variable for non-EU27 countries) [t=2000]	EMN - Annual Report on Migration and International Protection Statistics 2003-2009 [http://emn.intrasoft-intl.com/Downloads/prepareShowFiles.do?entryTitle=2%2E%20Annual%20Reports%20on%20Migration%20and%20International%20Protection%20Statistics]
Common language	Dummy	Dummy variable for common official primary language for origin A and destination B countries	CEPII Geodist dyadic dataset [http://www.cepii.fr/anglaisgraph/bdd/distances.htm]
Accession country	Dummy	Dummy variable for EUF countries (candidates or future EU countries)	

Immigration from ROW	Persons	Flow of immigrants (stock of persons born in country A living in country B at time t minus stock of persons born in country A living in country B at time t-1) between Rest of the World origin countries (non EU, non ENP, non EUF) and EU14 destination countries [t=2010, t-1=2000]	World Bank - Global Bilateral Migration Database [http://data.worldbank.org/data-catalog/global-bilateral-migration-database]
Foreign born from ROW	Persons	Stock of immigrants (stock of persons born in country A living in country B at time t) from Rest of the World countries (non EU, non ENP, non EUF) now living in EU14 [t=2010]	World Bank - Global Bilateral Migration Database [http://data.worldbank.org/data-catalog/global-bilateral-migration-database]

Foreign Born 2000															
Origin/Destination		**Austria**	**Belgium**	**Denmark**	**Finland**	**France**	**Germany**	**Greece**	**Ireland**	**Italy**	**Luxem-bourg**	**Nether-lands**	**Spain**	**Sweden**	**United Kingdom**
EU13	Bulgaria	5,951	1,085	696	478	7,946	20,786	33,726	605	10,434	165	2,028	21,845	3,469	1,378
	Cyprus	100	79	143	81	29,024	11,750	16,742	198	196	12	266	117	448	79,291
	Czech Republic	10,316	760	796	301	220,766	402,366	651	1,348	5,693	259	5,263	1,526	4,430	1,123
	Estonia	77	218	597	31,597	14,705	42,892	52	640	393	28	179	166	13,485	51
	Hungary	17,955	1,294	1,550	849	37,635	71,830	518	483	5,068	291	5,231	1,178	13,975	7,050
	Latvia	215	151	992	1,125	13,193	56,469	36	2,689	638	15	308	423	3,032	67
	Lithuania	294	222	1,487	647	28,059	126,069	116	2,393	582	25	441	3,459	1,032	148
	Malta	47	3	53	23	9,528	337	38	221	1,141	17	225	94	86	733
	Poland	30,833	7,205	10,467	1,366	800,387	1,999,975	12,332	2,606	43,300	1,003	17,635	13,253	39,685	207,480
	Portugal	1,341	26,651	672	177	141,016	138,240	254	618	5,262	41,352	10,385	45,479	2,487	3,338
	Romania	24,647	2,487	2,017	707	123,957	324,085	21,132	5,264	119,123	568	4,822	47,854	11,646	21,684
	Slovakia	10,916	565	437	120	58,839	118,829	319	391	3,283	94	97	982	3,353	296
	Slovenia	9,722	309	112	35	3,471	21,893	52	76	4,844	83	32	219	675	12
EUF	Albania	2,372	1,951	91	48	32,356	221,897	420,838	184	275,300	221	509	377	370	0
	Bosnia and Herzegovina	152,381	3,073	28,233	1,610	37,277	186,646	286	941	26,927	1,720	594	1,660	50,956	115
	Croatia	85,547	1,688	917	836	8,029	224,721	214	546	29,209	288	154	835	5,171	27
	Iceland	166	61	5,750	117	2,943	6,984	24	58	227	307	382	247	3,492	0
	Macedonia	19,326	1,907	2,273	155	3,145	54,994	720	33	44,657	251	35	214	2,336	10
	Turkey	179,638	58,404	29,369	2,055	76,505	2,008,979	7,603	613	9,649	288	176,306	796	31,545	12,709
ENP	Algeria	546	8,004	932	456	1,057,135	20,295	267	861	15,861	347	3,873	23,269	1,664	40,555
	Armenia	654	195	569	89	2,961	21,695	7,438	52	280	6	252	2,502	448	15
	Azerbaijan	140	13	125	41	382	2,055	102	43	99	4	423	144	249	2
	Belarus	373	45	239	154	791	3,813	336	610	1,680	42	71	667	590	46

Egypt	6,661	724	1,247	388	5,060	14,208	7,156	620	43,477	107	9,381	1,631	2,062	26,975
Georgia	332	254	110	47	15,420	75,104	21,977	150	318	12	113	1,341	174	82
Israel	1,696	1,679	1,423	442	4,919	9,351	335	285	2,561	74	4,314	912	1,500	7,729
Jordan	412	289	961	133	635	11,007	646	137	2,983	6	827	1,202	1,056	636
Lebanon	544	1,016	11,982	283	11,033	51,611	1,228	151	4,163	92	3,060	1,657	19,817	11,219
Libya	357	61	167	68	413	831	188	737	3,382	15	466	438	370	136
Moldova	308	135	109	65	2,608	13,736	5,492	958	6,680	15	22	1,833	97	180
Morocco	827	110,962	4,776	998	262,462	84,619	521	302	286,498	557	151,254	253,173	4,443	20,878
Russia	4,895	1,129	2,669	10,527	217,690	978,793	16,847	2,695	14,864	461	23,439	11,316	8,579	15,053
Syria	825	690	1,328	183	5,550	26,114	5,334	153	3,411	33	5,662	2,720	14,005	5,646
Tunisia	1,710	3,762	728	292	310,949	25,260	225	125	75,808	237	3,800	1,005	2,698	9,948
Ukraine	2,534	540	1,056	878	11,687	58,163	13,082	1,566	13,755	204	225	18,491	1,919	783
ROW	84330	66931	171837	32897	1021516	1205243	85837	89713	774729	12220	726480	874109	343684	2976097

Table 1: Stock of Immigrants 2000

Immigration rate (%) 2000-2010															
	Origin/Destination	**Austria**	**Belgium**	**Denmark**	**Finland**	**France**	**Germany**	**Greece**	**Ireland**	**Italy**	**Luxem-bourg**	**Nether-lands**	**Spain**	**Sweden**	**United Kingdom**
EU13	Bulgaria	54.6	185.5	95.1	79.9	107.6	259.3	60.0	125.4	317.2	21.0	276.7	693.1	33.6	2468.0
	Cyprus	198.0	213.9	-2.6	61.1	-96.2	-88.0	17.7	81.0	11.5	9.6	23.8	189.2	19.8	-14.7
	Czech Republic	383.0	311.4	-9.2	36.9	-96.2	-86.4	110.6	479.4	25.6	16.8	-31.4	531.6	31.1	2124.4
	Estonia	163.1	473.7	79.3	-41.0	-94.7	-85.7	156.7	448.6	142.9	19.6	888.7	682.0	12.0	5167.1
	Hungary	115.7	465.3	52.5	47.1	-68.1	24.7	-57.9	915.7	40.3	20.4	20.7	579.7	7.0	254.3
	Latvia	143.8	1252.8	100.0	66.5	-90.4	-76.0	89.3	669.4	121.4	19.6	872.0	562.8	24.0	40289.7
	Lithuania	66.3	845.4	191.2	66.6	-95.1	-86.0	130.2	1435.9	227.8	14.8	787.5	566.2	95.9	46314.5
	Malta	86.3	5589.2	39.8	56.7	-90.5	60.0	729.0	88.5	-8.5	19.6	20.1	197.5	35.3	3449.8
	Poland	148.0	496.6	125.9	63.5	-84.7	-69.3	205.7	3481.4	170.9	20.0	138.7	556.2	55.9	151.3
	Portugal	-7.4	-0.6	64.2	36.7	440.7	32.2	-21.7	261.5	19.6	20.6	23.7	243.2	23.4	2425.6
	Romania	131.0	769.9	107.5	71.2	-56.2	-58.4	114.3	140.9	582.5	20.2	80.8	1593.6	39.0	144.8
	Slovakia	119.6	115.7	46.7	63.1	-91.2	-67.2	99.9	3004.8	195.6	18.3	1961.7	742.3	24.1	16778.0
	Slovenia	82.6	-92.7	84.8	71.7	212.9	52.8	86.1	161.3	-16.9	21.0	11.9	414.5	37.4	13454.7
EUF	Albania	1.0	-3.4	199.0	43.1	-90.6	-92.8	60.8	154.0	89.8	20.7	39.6	390.0	76.2	0.0
	Bosnia and Herzegovina	6.6	-98.0	-18.6	79.6	-60.4	35.2	55.4	152.6	32.1	21.0	2.8	41.2	16.3	7607.8
	Croatia	-39.0	-97.5	-6.9	80.1	305.7	59.9	99.1	130.0	-5.1	20.8	4.3	140.0	34.2	34201.2
	Iceland	6.3	258.5	66.4	76.1	-87.1	-68.3	47.9	113.0	-19.2	20.4	4.8	466.6	32.3	0.0
	Macedonia	5.7	-96.8	18.3	80.5	233.8	81.2	89.7	138.3	127.4	21.0	-28.7	157.6	54.1	16920.6
	Turkey	-10.5	61.9	36.7	119.9	291.5	36.0	-49.5	99.7	96.2	20.4	10.6	299.6	28.7	465.1
ENP	Algeria	34.5	169.2	27.4	68.7	-13.6	3.9	41.5	126.0	85.9	16.8	-1.0	172.2	33.6	-61.5
	Armenia	-9.9	491.5	30.7	65.9	389.1	-28.5	17.9	159.2	97.8	19.6	658.7	395.1	98.3	5162.9

Azerbaijan	40.0	751.3	50.0	67.5	-8.5	1032.1	53.1	161.2	156.7	19.6	567.0	294.9	117.1	37451.3
Belarus	48.6	1103.0	134.1	66.1	36.2	664.1	61.0	88.2	230.1	22.4	626.0	474.1	120.8	3260.4
Egypt	79.9	258.6	37.3	80.1	453.8	47.0	28.9	134.8	108.1	20.7	20.5	156.6	36.9	4.2
Georgia	98.4	63.8	43.7	57.1	-92.5	-75.8	90.3	144.1	313.8	19.6	732.6	698.1	121.5	799.7
Israel	27.8	126.6	40.8	80.6	77.3	50.6	124.2	128.6	18.4	21.2	20.7	225.8	45.7	75.1
Jordan	32.0	115.5	38.9	80.7	51.1	42.4	49.7	144.3	24.7	19.6	5.4	96.9	50.6	548.7
Lebanon	175.6	332.2	28.3	79.5	312.0	19.3	206.1	148.5	143.7	20.9	9.6	110.9	23.3	39.2
Libya	17.9	549.2	38.8	81.8	268.2	437.8	55.6	138.7	-41.7	19.6	26.7	293.8	49.4	8802.8
Moldova	45.5	167.7	74.5	66.4	-72.1	26.9	34.4	248.1	1235.1	19.6	590.5	857.5	173.6	238.5
Morocco	41.4	55.6	34.4	59.5	220.4	28.2	36.1	94.9	66.1	19.8	10.6	207.5	40.5	-40.2
Russia	77.4	2794.5	91.8	66.6	-80.2	-69.4	125.4	150.0	88.3	18.8	-74.9	442.2	58.1	121.3
Syria	162.8	324.0	71.0	80.1	192.3	54.5	99.1	105.6	34.9	19.6	18.4	100.5	38.5	-2.2
Tunisia	60.7	195.8	34.2	76.4	-2.8	46.7	58.4	99.5	60.5	19.6	11.4	170.7	33.8	-59.1
Ukraine	68.8	265.5	486.3	66.6	29.6	248.2	89.8	221.1	1154.6	20.8	610.4	377.4	76.8	3090.2

Table 2: Immigration Rate 2000-2010

Figure 1: EU 14, EU13, EUF and ENP countries