Institutions and the Location Decisions of Highly Skilled Migrants to Europe

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Contribution to the Project

This research focuses on the potential impact of policies on the structure of migration and on the attitudes of the native population towards migration. It draws conclusions on how migration and labor market policy institutions affect a) the structure of migration and b) are most likely to cause potentially costly social conflict between natives and migrants.

Institutions and the Location Decisions of Highly Skilled Migrants to Europe

Klaus Nowotny*

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Abstract

This paper investigates the economic, labor market and institutional factors that make regions and countries attractive for highly skilled migrants vis-à-vis low-skill migrants. Based on micro-data for 11 EU countries, a discrete choice model estimated at the NUTS-2 level shows that location decisions are not only determined by factors related to earnings opportunities, distance, networks, common language and colonial relationships, but also by institutional factors such as migration policy, the income tax system, or labor market institutions; it also lends some support to the welfare magnet hypothesis: a higher unemployment replacement rate increases the attractiveness of a country. The empirical analysis however reveals only minor differences in the effects of institutions on location decisions by skill level, limiting the scope for policy makers to affect the skill composition of migration.

JEL classification numbers: F22, R23, C35

Keywords: highly skilled migration, regional location decisions, institutions, migration policy

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1 Introduction

The economic literature provides ample evidence that migration of highly skilled workers is beneficial for the host economy: highly skilled migrants can enhance technology adaption and adoption by spurring innovation and knowledge spillovers (Kerr, 2008; Hunt and Gauthier-Loiselle, 2010), their skills are more likely to be complementary to those of natives relative to low-skill migrants (Fujita and Weber, 2004; Alesina and La Ferrara, 2005; Ottaviano and Peri, 2006; Niebuhr, 2010), they are more often entrepreneurially-minded (Saxenian, 2000) and can also provide information which increases trade and FDI flows between sending and receiving countries (Docquier and Lodigiani, 2010). Furthermore, highly skilled migrants rely less on public services and tend to be net contributors to the welfare system (Razin et al., 2011). Given this evidence, it is not surprising that migration policy in many countries focuses on the skill composition of migrants, contributing to an increasing international competition for highly skilled labor.

Highly skilled migrants are also vital for the competitiveness of European economies (Huber et al., 2010), especially in the face of aging societies and increasing pressures on the welfare systems. But compared to countries such as the USA or Canada, European Union countries receive on average lower shares of migrants with tertiary education, raising concerns that the EU does not attract enough highly skilled migrants: according to the OECD's Database on Immigration in OECD Countries (DIOC), the (unweighted) average share of highly skilled among the foreign-born is only 20 % in the OECD EU countries, compared to 26 % in Australia and the USA, 31 % in New Zealand and 38 % in Canada (Huber et al., 2010, p. 32). Focusing on the foreign-born age 25–64, the (unweighted) average of the share of highly skilled across 19 EU OECD countries is only 25 %, compared to 35 % in the USA, 36 % in Australia, 38 % in New Zealand and 46 % in Canada (OECD, 2007, p. 133). This holds true even after controlling for differences in the sending country structure between the EU and the non-EU OECD countries (see Huber et al., 2010, p. 35).

However, there is considerable heterogeneity across EU countries: the share of highly skilled among the foreign-born ranges from less than 15 % in Austria, Italy and Germany to more than 35 % in Denmark, Sweden, the UK and Ireland (Huber et al., 2010). The heterogeneity is even more pronounced at the regional level, where the share of highly skilled among the foreign-born ranges from as low as 5 % in some to more than 50 % in other regions according to data from the European Union Labour Force Survey (EU-LFS) for 2006/2007.

The paper uses this heterogeneity across EU countries and regions to analyze the economic, labor market and institutional factors that make regions and countries attractive for highly skilled migrants and favor the immigration of the highly skilled vis-à-vis the immigration of the low-skilled. The paper contributes to both the literature on the impact of institutions on migration, where it extends previous approaches by differentiating migrants by skill levels, as well as to the literature on the sorting of immigrants (see, for example, Grogger and Hanson, 2011) by considering the role of a wider set of institutional variables (including migration policy, welfare and tax systems) on the location decisions of highly skilled migrants while controlling for labor market and economic conditions and migrant networks in the empirical analysis. Furthermore, the paper extends previous papers (see, for example Geis et al., 2013) not only by considering a larger set of host countries, but also by using a special evaluation of the EU-LFS, a large-scale micro-dataset which allows an analysis of location decisions at the regional (NUTS-2) level. By estimating the empirical model at the regional level, the empirical analysis is able to take into account within-country heterogeneity that would be missing in country-level regressions.

2 Literature

The empirical literature on migration has considered a variety of variables as determinants of migration. But while early works (see, for example, Sjaastad, 1962; Todaro, 1969) focused mainly on economic determinants such as wages, unemployment rates or migration costs, recent contributions increasingly focus on the impact of institutional factors: for example, following Borjas' (1999) paper on the "welfare magnet hypothesis", various papers analyzed the impact of the generosity of the welfare system on migration flows (see Giulietti and Wahba, 2013, for an overview).

Although some papers have shown that migrants have a higher take-up rate for welfare provisions (see Borjas and Trejo, 1991; Borjas and Hilton, 1996, the special issues 1 and 2 of the International Journal of Manpower, 2013, or the discussion in Giulietti and Wahba, 2013), the empirical evidence on the welfare state as a determinant of location decisions is far from being conclusive. While Borjas (1999) concludes that welfare-receiving immigrants in the US show a higher degree of clustering, Levine and Zimmerman (1999) find little to no support for the welfare magnet hypothesis in their analysis of moves within the US. In addition, there are only few studies for the EU or single European countries. In their analysis of migration flows to 22 OECD countries, Pedersen et al. (2008) find only weak results for their welfare generosity proxy (public social expenditure as a percentage of GDP) which are even negative in some regressions. Giulietti et al. (2013) also provide only limited support for the welfare magnet hypothesis after controlling for the possible endogeneity of their welfare generosity variable (unemployment benefit spending). On the other hand, results by Åslund (2005) or Damm (2009) point to welfare seeking behavior by immigrants to Sweden and Denmark.

In the paper that is closest to this work, Geis et al. (2013) analyze the effect of welfare variables and institutional determinants of target country choice but find mixed effects for their proxies for welfare generosity in a study covering France, Germany, the UK and the US. For example, they find a negative effect of unemployment and pension replacement rates on country choice (which could be attributed to a higher "implicit tax rate" associated with more generous welfare systems), but positive effects for the quality of health care and educational systems. Similar results were found by Nowotny (2011) for 13 of the EU-15 countries. The empirical evidence for the welfare magnet hypothesis is thus mixed at best. This is also acknowledged in a recent literature overview by Giulietti and Wahba (2013). Furthermore, as shown by Razin and Wahba (2011), the effect of welfare generosity may depend on the migration regime, i. e. whether there is free or restricted migration between the host and home countries.

While there are some studies analyzing the effect of institutions on migration decisions, the number of contributions that consider the effect of institutions on the migration of highly skilled (or the skill composition of migration in general) is limited.[1] Brücker et al. (2002) show how the generosity of the welfare system may affect the location decisions of workers by skill levels. Their cross-country empirical estimates suggest a positive correlation between having a generous welfare system and having a high proportion of migrants with less than secondary education, but the effect is not significant at conventional levels (p. 88). Belot and Hatton (2012) investigate the selection by skill among migrants to 21 OECD countries using an extended Roy model; in an additional regression they also control for a limited set of institutional variables capturing two aspects of migration policy. Their dummy variables for low restrictions on the migration of professionals and having a points system that favors highly-skilled immigration have a positive effect on skill selection. González and Miles-Touya (2014) find that more restrictive visa requirements for Colombian and Ecuadorian citizens shifted the skill composition of migrants from these countries to Spain towards higher skill levels. In a recent contribution, Nifo and Vecchione (2014) analyzed the effect of the quality of regional institutions on the regional mobility of highly skilled workers within Italy, and found that the rule of law, the effectiveness of policies and social capital are important for the migration decisions of university graduates.

Another institutional aspect that may be important for international migration is income taxation, which not only affects the net income available in the target country but also the level of public services since taxes on labor income are the most important source of overall tax income and account for almost half of all tax revenues in the EU (see Eurostat, 2013b, p. 29). Geis et al. (2013), for example, find a negative effect of the income tax wedge on country choice. Egger and Radulescu (2009) analyze the impact of the structure of the income tax system on migration flows and stocks of skilled

[1] Geis et al. (2013) also investigate differences between skill groups, but only differentiate between unskilled (ISCED 0–2) and skilled migrants (ISCED 3–6) and do not consider the highly skilled as defined in this paper (see next section) as a separate group. Additionally, they focus on a limited set of institutional variables that does not include aspects of migration policy. Geis et al. (2011), on the other hand, differentiate between low-, medium and highly skilled, but provide only descriptive evidence.

migrants with at least secondary education. The authors show that the largest effect can be found for the progressivity of the income tax system, followed by employee- and employer-borne income tax rates.

This paper contributes to the existing literature by considering a broader range of institutional variables, including indicators for the welfare system, the income tax system and migration policy in a single regression. In addition, it considers a larger set of European Union countries and models location decisions at the regional level. Furthermore, the empirical analysis allows for a detailed investigation of possible differences in determinants of location decisions across skill groups while controlling for a wide range of background characteristics.

3 Data and empirical strategy

3.1 Migration data and stylized facts

Since most datasets that distinguish between high- and low-skill migrants are not available at the regional level (such as the data used by Docquier and Marfouk, 2006), this paper uses individual-level microdata from the 2007 EU-LFS to estimate the determinants of highly-skilled migrants' location choice at the regional (NUTS-2) level. The EU-LFS is a large survey conducted among private households in the EU on a quarterly basis (see Eurostat, 2012, 2013a).

In the EU-LFS microdata data at hand, each observation represents a specific combination of individual characteristics (including region of residence, sex, age, educational attainment, labor market status, etc.) and contains a weight which gives the number of individuals represented by this observation (i. e., the number of individuals in the population characterized by a specific combination of individual characteristics). Unfortunately, the data lack information about how many persons were interviewed per combination of characteristics; all that is known is that it must have been at least one person.

While EU-LFS data disseminated by Eurostat usually contain only aggregated information on the sending countries, the microdata available to the author provides detailed information on migrants' country of birth as well as the region of residence at the NUTS-2 level. For the empirical analysis we consider all individuals born outside their country of residence as migrants. Because the aim of the paper is to identify the factors that determine the location decisions of migrants to the EU-15, we focus only on individuals born outside the EU-15.[2] We furthermore restrict the analysis to "recent

[2]The EU-15 include Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and the UK. Migration within the EU-15 is not considered, because it is governed by a different migration regime (free mobility) than migration to the EU-15 countries, which can affect the estimation results (see Razin and Wahba, 2011). In principle, data on migrants living in the new member states that joined the European Union in 2004 and 2007 are available from the EU-LFS.

migrants", i. e. migrants who moved to the EU during the last 10 years before the interview (between 1998 and 2007), and who were between 25 and 64 years of age in 2007. Those who migrated more than 10 years ago are used to calculate migration networks (see section 3.4). The EU-LFS data also include information on the skill level based on the UNESCO's International Standard Classification of Education (ISCED), which allows us to distinguish between low-skilled (ISCED 0–2 equivalent level of education), medium-skilled (ISCED 3–4) and highly skilled migrants (ISCED levels 5 and 6).[3]

The EU-LFS data have two drawbacks: first, the data only provide information about those who have been living in the respective member country at the time of the interview, so there is no information about repeat and return migration which would be important for the calculation of migrant networks (see below). The empirical results in this paper are thus most relevant for long-term migration. Second, the EU-LFS does not contain information on country of birth for Germany and Ireland. For Germany, information on nationality from the EU-LFS is used instead of country of birth to identify migrants. Although it is an imperfect measure of migrant status (migrants who have attained German citizenship through naturalization can no longer be identified as migrants), the error will be rather small because the focus of the empirical analysis is on more recent migrants and immigrants usually have to be German residents for several years before they can apply for the citizenship. It will, however, affect the calculations of migrant networks. In the Irish data, information on both country of birth and nationality is missing. Ireland must therefore be excluded as a receiving country. The empirical analysis therefore considers only regions in 14 of the EU-15 countries as receiving countries. In the following discussion, the EU-15 excluding Ireland will be referred to as EU-14.

Another issue with the EU-LFS data is reliability. Eurostat publishes guidelines for the dissemination of population figures calculated from the EU-LFS to avoid publication of unreliable information. These guidelines highlight two reliability limits: population figures calculated from EU-LFS microdata where the sum of the sample weights is less than the lower limit should not be published at all, while population figures between the lower and upper limit are considered as less reliable and can be published with a warning concerning the limited reliability. Population figures exceeding the upper limit can be published without restrictions. The reliability limits for publication vary over countries due to differences in population and sample size: for example, population figures for Luxembourg should not be published if they represent less than 500 individuals. In Germany, population figures representing less than 50,000 individuals

But given the low number of migrants in these countries they are less reliable and the new member states are therefore not used as receiving countries in the analysis.

[3]Of course, the level of formal education is not the only aspect of a migrant's skill level; informal education and on-the-job experience also constitute important components of an individual's "skill" but are, unfortunately, unobserved. This paper therefore assumes that the highest completed level of education is representative for (or at least highly correlated with) the "true" skill level.

Table 1: Number of recent migrants to EU-14 countries by skill levels

	Number of observations			
	Unweighted		Weighted	
Educational attainment	*N*	%	*N*	%
N. A.	380	1.78	61,400	0.82
Low skilled (ISCED 0–2)	7,838	36.62	2,609,200	35.03
Medium skilled (ISCED 3–4)	8,451	39.49	3,099,500	41.62
Highly skilled (ISCED 5–6)	4,732	22.11	1,677,800	22.53
Total	21,401	100.00	7,447,900	100.00

N. A.: not available. Weighted numbers based on weights provided in EU-LFS and rounded to the nearest hundred. EU-14: EU member states as of 2003, excluding Ireland. Includes only recent migrants who moved to the EU-14 between 1998 and 2007 and who were between 25 and 64 years of age in 2007. Source: EU-LFS 2007, own calculations.

should not be published (for a list of all reliability limits see Eurostat, 2013a). The empirical analysis of section 4 is, however, not based on population figures, but on the individual-level microdata which are weighted using the sample weights provided in the EU-LFS; because observations that are less reliable will also have a lower sample weight, less reliable observations will thus have a smaller effect on the regression results than more reliable observations.

The number of observations in each skill category is shown in table 1. The table shows both the (unweighted) number of observations in the sample as well as the (weighted) number of migrants using the weights provided in the EU-LFS. For the empirical analysis 7,838 individual level observations for low-skilled and 4,732 individual level observations observations for highly skilled migrants can be used. According to the weighted data, about 22.1 % of the 7.45 m migrants from 149 countries who moved to the EU-14 between 1998 and 2007 are highly skilled, while the number of low-skilled immigrants is higher by more than a half (35.0 %). The EU-LFS data thus confirm the figures mentioned in the introduction citing a share of highly skilled among the foreign-born in the EU of about 20 %.

There is, however, a considerable variation across EU countries. Table 2 shows the receiving country distribution of recent migrants to the EU-14 in total and for high- and low-skilled migrants. The table shows that the country receiving the largest number of recent migrants between 1998 and 2007 according to the EU-LFS data is Spain, which received about one third (33.0 %) of all recent migrants. Spain was also the country that received the largest amount of low-skilled migrants in the period under consideration: 37.5 % of all recent low-skilled migrants to the EU-14 moved to Spain. The second most important receiving country was Italy (21.5 %), followed by the UK (10.6 %). Spain was, however, also the country receiving the largest number of highly skilled migrants: 31.3 % of all recent highly-skilled migrants who moved to the EU-14 between 1998 and 2007 were living in Spain, followed by the UK (24.2 %) and France (12.1 %). While about one fifth of all recent low-skilled immigrants to the EU-14 moved to Italy, the country received only 8.8 % of all recent highly skilled migrants.

Table 2: Structure of recent migration to EU-14 countries

	All migrants		Highly skilled		Low-skilled		Highly skilled relative to	
Country	in 1,000	in %	in 1,000	in %	in 1,000	in %	All mig. in %	Low-skilled
Austria	201.5	2.7	38.5	2.3	64.7	2.5	19.1	0.596
Belgium	148.8	2.0	42.2	2.5	60.8	2.3	28.3	0.694
Denmark	54.6	0.7	10.1	0.6	8.6	0.3	18.4	1.175
Finland	17.1	0.2	6.0	0.4	5.0	0.2	34.8	1.194
France	575.2	7.7	202.8	12.1	208.9	8.0	35.3	0.971
Germany	620.6	8.3	147.8	8.8	206.8	7.9	23.8	0.715
Greece	178.6	2.4	24.7	1.5	92.2	3.5	13.9	0.268
Italy	1,206.5	16.2	147.0	8.8	559.8	21.5	12.2	0.263
Luxembourg	9.4	0.1	5.0	0.3	1.8	0.1	52.9	2.750
Netherlands	173.7	2.3	46.0	2.7	48.5	1.9	26.5	0.948
Portugal	133.1	1.8	25.5	1.5	66.7	2.6	19.2	0.382
Spain	2,455.0	33.0	525.5	31.3	979.8	37.5	21.4	0.536
Sweden	132.9	1.8	50.6	3.0	28.4	1.1	38.1	1.784
UK	1,541.0	20.7	406.1	24.2	277.3	10.6	26.4	1.465
EU-14	7,447.9	100.0	1,677.8	100.0	2,609.2	100.0	22.5	0.643

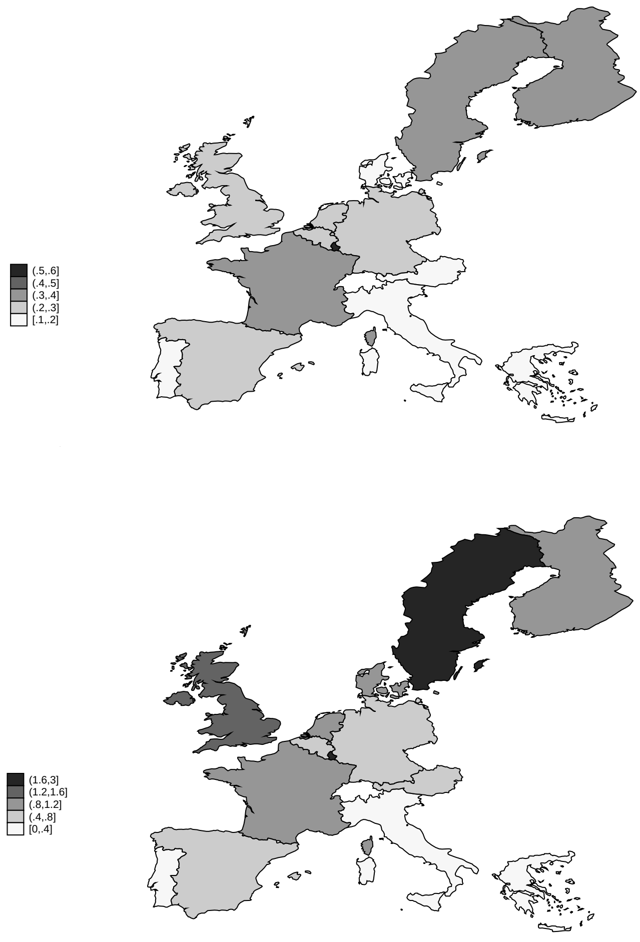
EU-14: EU member states as of 2003, excluding Ireland. Includes only recent migrants who moved to the EU-14 between 1998 and 2007 and who were between 25 and 64 years of age in 2007. Source: EU-LFS 2007, own calculations.

Table 2 and the top panel of figure 1 also show the share of recent migrants with tertiary education relative to all recent immigrants at the country level. Using this share, the EU-14 can broadly be categorized into four groups: the first group consists of the two countries with the lowest shares of recent highly skilled among all recent migrants, Italy and Greece (12.2 and 13.9 %). The second group has shares between 18 and 24 % and includes Denmark, Austria, Portugal, Spain and Germany. The third group consists of three countries with a share of recent highly skilled migrants between 26 and 29 % and includes the UK, the Netherlands and Belgium. The countries with the highest share of tertiary migrants in the stock of recent migrants are Finland (34.8 %), France (35.3 %), Sweden (38.1 %) and Luxembourg (52.9 %).

Finally, we can also consider the ratio of recent highly skilled migrants to recent low-skilled migrants as a measure of the skill structure of migration. The ratio takes into account that the educational structure of migration in two countries that have the same share of highly skilled migrants may still differ considerably if one country has a higher share of low-skilled migrants. Furthermore, in some countries the education level is missing for a large proportion of migrants in the EU-LFS data at hand, which may affect the results based on the share of highly skilled migrants. This is especially important for Denmark, where educational attainment is unobserved for 28.7 % of all observations, but may also affect the results for Sweden (6.9 % missing) the Netherlands (4.0 % missing) and the UK (1.7 % missing). The high- to low-skilled ratio can be expected to be less affected by missing values if missingness is not related to educational level.

The distribution of the ratio is shown in table 2 and the bottom panel of figure 1. It has an even higher variation across EU countries than the share of recent highly skilled migrants: while there are about 4 recent low-skilled migrants for each recent highly skilled migrant in the countries at the bottom end of the distribution (Italy and Greece,

Figure 1: Share of recent highly skilled migrants among all recent migrants (top) and relative to the share of recent low-skilled migrants (bottom)



Source: EU-LFS 2007 for EU-14 (EU-15 countries except Ireland), own calculations. Includes only recent migrants who moved to the EU between 1998 and 2007 and who were between 25 and 64 years of age in 2007.

ratios 0.26 and 0.27), in five countries the number of recent migrants with tertiary education is even higher than the number of migrants with primary education. Among them are the Scandinavian countries (Denmark, Finland and Sweden) as well as the UK. The top position is again held by Luxembourg, with almost three recent highly skilled migrants for each recent low-skilled migrant (ratio 2.75), while Spain, Austria, Belgium and Germany are close to the average value (0.64). The Netherlands and France, on the other hand, have an almost balanced number of high- and low-skilled migrants with ratios of almost one.

3.2 Empirical specification

The empirical analysis will estimate the regional location decisions of these recent high- and low-skilled migrants within the EU at the individual level using a conditional logit model. To motivate the empirical specification consider the location choice of migrant i who intends to migrate to the EU-14 and faces $K = \{1, \ldots, 200\}$ alternative regions. Assuming that the utility function is linear in the attributes of the regions, i's utility of moving to a specific region $s \in K$ is a linear function of the characteristics of region s, the characteristics of i as well as an unknown utility component ε_{is} which is treated as random. The characteristics of the region can be decomposed into a vector of regional characteristics (R_{is}, including region-specific fixed effects) and a vector of characteristics of the country region s is located in (C_{is}), including institutional variables. If we denote the vectors of individual and sending country characteristics as X_i and S_i, the utility function can be written as:

$$u_{is} = \alpha' R_{is} + \beta' C_{is} + \gamma' X_i + \theta' S_i + \varepsilon_{is} \tag{1}$$

The utilities are, of course, not observed, but assuming utility maximizing behavior we can interpret the information that individual i chose to migrate to region s as a signal that $u_{is} \geq u_{ik} \; \forall \; k \in K \neq s$ and predict the final outcome in terms of probability.

Under the assumption that the errors ε_{is} are i. i. d. extreme value, the probability that migrant i chooses region s can then be estimated by the well-known conditional logit model (McFadden, 1974):

$$\Pr(y_{is} = 1 | R_{ik}, C_{ik}, X_i, S_i) = \frac{\exp(\alpha' R_{is} + \beta' C_{is} + \gamma' X_i + \theta' S_i)}{\sum_{k=1}^{K} \exp(\alpha' R_{ik} + \beta' C_{ik} + \gamma' X_i + \theta' S_i)} \tag{2}$$

with log-likelihood function

$$LL(\beta) = \sum_{i=1}^{N} \sum_{s=1}^{K} y_{is} \ln Pr(y_{is} = 1 | R_{ik}, C_{ik}, X_i, S_i)$$

where $y_{is} = 1$ if migrant i chose region s and zero otherwise. A prominent feature of the conditional logit approach is that all variables which do not vary across alternatives—such as individual or sending country characteristics—cancel out in equation (2) unless they are interacted with an alternative-specific explanatory variable. The probability in (2) can thus be rewritten as:

$$\begin{aligned}
\Pr(y_{is} = 1 | R_{ik}, C_{ik}, X_i, S_i) &= \frac{\exp(\alpha' R_{is} + \beta' C_{is}) \exp(\gamma' X_i + \theta' S_i)}{\sum_{k=1}^{K} \exp(\alpha' R_{ik} + \beta' C_{ik}) \exp(\gamma' X_i + \theta' S_i)} \\
&= \frac{\exp(\alpha' R_{is} + \beta' C_{is})}{\sum_{k=1}^{K} \exp(\alpha' R_{ik} + \beta' C_{ik})}
\end{aligned} \tag{3}$$

Equation (3) shows that the probability of choosing region s conditional on R_{ik}, C_{ik}, X_i and S_i is independent of individual and sending country characteristics. This allows estimation without sending country data based on receiving region characteristics alone, which not only reduces the amount of data required (cf. Ortega and Peri, 2009), but also controls for any unobserved and unobservable individual or sending country characteristics which could lead to omitted variable bias in a cross-section regression. Related applications of the conditional logit model in the empirical literature on the determinants of location decisions include Bartel (1989), Bauer et al. (2005, 2007, 2009), Gottlieb and Joseph (2006), Jaeger (2007), Christiadi and Cushing (2008) or Geis et al. (2013), to name just a few.

Although the main factors of interest (such as the institutional variables) in equation (3) are country-specific and not region-specific, estimating the model on the regional level has an important advantage compared to estimating the model on the country level. To show this, note that any probability can be reformulated as the product of a conditional and a marginal probability. The probability of choosing region s in country v can thus be reformulated as the product of the probability of choosing country v (the marginal probability) and the probability of choosing region s, given the individual chose country v (conditional probability). If we partition the set of regions K into M subsets $K = \{K_1, \ldots, K_M\}$ (one for each receiving country) where each $K_m \subset K$ consists of q_m regions denoted $k_m = \{1, \ldots, q_m\}$, equation (3) can be rewritten as:

$$\begin{aligned}
\Pr(y_{is} = 1) &= \frac{\exp(\alpha' R_{ivs} + \beta' C_{iv})}{\sum_{m=1}^{M} \sum_{k_m=1}^{q_m} \exp(\alpha' R_{imk_m} + \beta' C_{im})} \\
&= \frac{\exp(\alpha' R_{ivs})}{\sum_{k_v=1}^{q_v} \exp(\alpha' R_{ivk_v})} \cdot \frac{\exp(\beta' C_{iv}) \cdot \left(\sum_{k_v=1}^{q_v} \exp(\alpha' R_{ivk_v}) \right)}{\sum_{m=1}^{M} \sum_{k_m=1}^{q_m} \exp(\alpha' R_{imk_m}) \cdot \exp(\beta' C_{im})} \\
&= \underbrace{\frac{\exp(\alpha' R_{ivs})}{\sum_{k_v=1}^{q_v} \exp(\alpha' R_{ivk_v})}}_{\Pr(y_{ivs}=1|z_{iv}=1)} \cdot \underbrace{\frac{\exp(\beta' C_{iv} + I_{k_v})}{\sum_{m=1}^{M} \exp(\beta' C_{im} + I_{k_m})}}_{\Pr(z_{iv}=1)}
\end{aligned} \tag{4}$$

where $z_{iv} = 1$ if migrant i chose country v (zero otherwise).[4] The first fraction in (4) is the probability of choosing region s in country v given the individual chose country v, $\Pr(y_{ivs} = 1 | z_{iv} = 1)$; it is independent of country characteristics because it is conditional on migrant i choosing country v. The second fraction is the probability of choosing country v, $\Pr(z_{iv} = 1)$, the probability that would be estimated in a country-level regression. As can be seen from equation (4) however, this probability depends not only on country characteristics C_{iv}, but also on regional characteristics via the log-sum terms $I_{k_m} = \ln \sum_{k_m=1}^{q_m} \exp(\alpha' R_{imk_m})$. These log-sum terms (sometimes also called the "inclusive utility", see Train, 2009, p. 83) capture within-country heterogeneity across regions and can be thought of as representing the expected utility of being able to choose the best alternative within country v. Since these terms would be missing in a country-level regression of $\Pr(z_{iv} = 1)$, estimating the model on the regional level using equation (3) avoids omitting relevant information.[5]

Because the goal of this paper is to identify the factors that favor the immigration of highly skilled relative to low-skilled migrants, the region- and country-specific variables in equation (3) will be interacted with a dummy for highly skilled migrants D_i^h ($= 1$ for migrants with ISCED levels 5 or 6, zero otherwise):

$$\Pr(y_{is} = 1 | R_{ik}, C_{ik}, X_i, S_i) = \frac{\exp(\alpha' R_{is} + \beta' C_{is} + \mu' R_{is} D_i^h + \omega' C_{is} D_i^h)}{\sum_{k=1}^{K} \exp(\alpha' R_{ik} + \beta' C_{ik} + \mu' R_{ik} D_i^h + \omega' C_{ik} D_i^h)} \quad (5)$$

If model (5) is estimated on low- and high-skilled migrants, the coefficients of the interaction terms μ and ω can be used to identify differences in the effects of the explanatory variables between high- and low-skill migrants.

In general, the interpretation of marginal effects in the presence of interaction terms is more complicated in nonlinear models than in linear regression models (see Ai and Norton, 2003; Norton et al., 2004). In the conditional logit model, interpretation of marginal effects is further complicated by the fact that the marginal effect of a variable on the probability of choosing alternative s depends not only on the level of this variable for alternative s, but also on the level of all other variables for all alternatives. There is, however, a straightforward interpretation of the regression results in terms of changes in

[4] A similar decomposition is used in the context of the nested logit model, see for example Cameron and Trivedi (2005, p. 510) or Train (2009, p. 82). Equation (4) is equivalent to a nested logit model where the dissimilarity parameters are restricted to one. Whether these restrictions hold could, in principle, be tested by estimating a nested logit model on the data. However, possibly due to the large number of alternatives it is difficult to achieve convergence in a FIML nested logit estimation on the data used if all explanatory variables and interaction terms are included.

[5] To illustrate this in a simple example, assume that there are two countries, each with two regions of equal size. In country A, both regions have a 10 % unemployment rate. In country B, region 1 has a 20 % unemployment rate while region 2 has a zero percent unemployment rate. From a country-level perspective, countries A and B would ceteris paribus be equally attractive, yet it can be expected that more migrants choose country B because it allows them to choose the best option within this country, i. e. the region with zero unemployment. The value of this option is represented by the inclusive value.

the odds (see Buis, 2010). The odds of choosing region s are defined as the probability of choosing region s over the probability of choosing a region other than s:

$$\text{odds}(y_{is}=1) = \frac{\Pr(y_{is}=1)}{1-\Pr(y_{is}=1)} \tag{6}$$

and can be interpreted as the expected number of migrants choosing s for every migrant choosing another region. For example, if $\text{odds}(y_{is}=1)=0.1$, we can expect 1 migrant to choose region s for every 10 migrants who chose another region. The exponentiated coefficients of a conditional logit regression represent multiplicative change in the odds (or odds ratios). If, for example, the exponentiated coefficient of the l-th regional characteristic R_{lk} is $e^{\alpha_l}=2$, an increase in R_{ls} by one unit raises the odds of choosing region s from 0.1 to $0.1\times 2=0.2$;[6] because the changes are multiplicative, an increase in R_{ls} by q units changes the odds of choosing region s by a factor of $(e^{\alpha_l})^q$. The advantage of using odds ratios to interpret the regression results is that—unlike marginal effects—they are independent of the specific probability of choosing a particular alternative.

The interpretation of the conditional logit coefficients in the presence of interaction terms is also relatively straightforward: as can easily be shown, the odds ratio for a one unit increase in the l-th regional characteristic for region s is given by $e^{\alpha_l+\mu_l}$ for highly skilled individuals ($D_i^h=1$) and by e^{α_l} for low-skilled individuals ($D_i^h=0$). For highly skilled migrants, the odds ratio is thus given by the exponentiated sum of the coefficient of R_{lk} and the coefficient of the interaction term of $R_{lk}D_i^h$. If $\mu_l=0$, the change in the odds of choosing region s following an increase in R_{ls} will be the same for both skill groups; if, however, $\mu_l<0$ ($\mu_l>0$), the odds ratio will be smaller (larger) for highly skilled migrants than for low-skill migrants.[7]

As is well known, in the conditional logit model the relative choice probabilities of two regions should depend only on the characteristics of these two regions, a property known as "independence from irrelevant alternatives" (IIA). Whether IIA holds could be tested by comparing the parameters of the unrestricted model (including all alternative regions) to the parameters of a restricted model where some alternatives are excluded (Hausman and McFadden, 1984). A significant test statistic provides evidence against IIA. However, the test does not offer guidelines which subset of alternatives should be excluded from K. Given that location decisions will be modeled at the NUTS-2 level and that there are 200 alternative regions in K, there are also 200 possible

[6] To put it differently: the exponentiated coefficient represents the ratio of the odds at $R_{ls}=\bar{R}_{ls}+1$ over the odds at $R_{ls}=\bar{R}_{ls}$,

$$e^{\alpha_l} = \frac{\text{odds}(y_{is}=1|R_{ls}=\bar{R}_{ls}+1)}{\text{odds}(y_{is}=1|R_{ls}=\bar{R}_{ls})}.$$

[7] The exponentiated coefficient of the interaction term alone e^{μ_l} can be interpreted as a ratio of the odds ratios for highly skilled relative to low-skilled migrants, see Norton et al. (2004, p. 160): the odds ratio for highly skilled migrants is e^{μ_l} times the odds ratio for low-skill migrants.

tests that can be performed if only one alternative is excluded at a time, 19,900 possible tests where two alternatives are excluded, 1,313,400 tests where three alternative regions are excluded in the restricted model, etc.; given the large number of possible tests that could be conducted, it is therefore highly likely to find at least one restricted model that indicates a violation of IIA (cf. Christiadi and Cushing, 2008). Nevertheless, the conditional logit model is attractive because of its computational simplicity, and it is still appropriate if the model is not too parsimoniously specified so that the unobserved portion of utility is essentially "white noise" (see Dahlberg and Eklöf, 2003; Christiadi and Cushing, 2008; Train, 2009, p. 35, or the discussion in Haan 2006 in the context of labor supply decisions). This paper therefore follows Davies et al. (2001), Bauer et al. (2005), Jaeger (2007), Christiadi and Cushing (2008), and others in using the conditional logit model to estimate the determinants of location decisions.

Because we only observe individuals who were living in the EU in 2007, the parameters α, β, μ and ω may measure the outcome of two different decisions: the decision to migrate to region s, and the decision to stay in region s until 2007. Geis et al. (2013) therefore include the values of regressors for the year of immigration (to measure the effect on the location decision) and for 2005, the last year in their data (to measure the effect on the decision to stay). This paper follows a slightly different approach by including alternative-specific fixed effects to control not only for the end-of-period values, but also for the average effect of unobserved variables that may affect the location (and stay) decision. In addition, alternative-specific fixed effects ensure that the error term in utility function (1) has zero mean.

However, the number of alternative-specific variables that do not vary over decision makers $i = 1, \ldots, N$ that can be included in a conditional logit regression is limited to $K - 1$, which implies that the coefficients of alternative-specific variables can only be estimated alongside the alternative-specific fixed effects if they also vary over decision makers.[8] While this is true for some alternative-specific variables (like distance or colonial history), it is not true for other variables in R_{ik} and C_{ik}: especially the institutional variables (but also other factors such as regional income or unemployment rates) vary only over k but not over i. Variation in these variables could be observed if the exact year of immigration were known; the data at hand however only reveal whether a person migrated between 1998 and 2007, or earlier. There is thus a missing data problem: if individual i's year of immigration t_i were known, the alternative-specific variables could be identified.

To solve this problem, the paper uses a Monte Carlo simulation procedure to reintroduce this variation across decision makers:

[8] This also implies that end-of-period values (such as in Geis et al., 2013) cannot be included in the same regression as alternative-specific fixed effects. Conversely, in the absence of alternative-specific fixed effects the impact of unobserved variables on location choice could be captured by the end-of-period values, which may call into question what exactly these variables really measure.

1. For individual $i = 1$, capture the country of birth b_1 and the country of residence v_1
2. Draw a uniformly distributed random number $\eta_1 \in [0,1)$
3. Assign a hypothetical year of immigration t_1 to individual $i = 1$ based on η_1 and the cumulative distribution of inflows of migrants from b_1 to v_1 in the 1998–2007 period, F_{bv}
4. Impute the values of the regional- and country-specific variables for year t_1 into R_{1k} and C_{1k}
5. Repeat steps 1–4 for all other individuals $i = 2, \ldots, N$
6. Estimate the model by conditional logit
7. Repeat steps 1–6 M times

This procedure ensures that all alternative-specific variables also vary over decision makers by introducing variation over time. By repeating the procedure M times it allows us to draw conclusions about the robustness of the estimated effects to different hypothetical years of immigration.

The simulation procedure can be interpreted as a variant of multiple imputation, a Monte Carlo method to deal with missing data and nonresponse in surveys (see Rubin, 1987, 1996; Schafer, 1999) where missing values for explanatory variables are imputed from the posterior predictive distribution of an imputation model to create M simulated datasets.[9] The regression of interest is then estimated on each of these datasets as if all regressors were observed and the results are combined to calculate coefficients and standard errors. In the simulation outlined above, imputations are not drawn from the posterior predictive distribution of an imputation model, but from the distribution F_{bv} of known values. Although the reason for imputation differs, the approach is similar. Coefficients and standard errors in this paper are therefore calculated using the formulas established in the multiple imputation literature. More specifically, the aggregate coefficient of explanatory variable l is calculated as:

$$\bar{\beta}_l^{Aggregate} = \frac{1}{M} \sum_{m=1}^{M} \hat{\beta}_l^m \tag{7}$$

[9] Note that the problem to be addressed by the simulation procedure described above is different from the sensitivity problem addressed by Leamer (1985), Levine and Renelt (1992), Sala-I-Martin (1997) or methods such as Bayesian or frequentist model averaging, which deal with uncertainty concerning the regressors to be included in a regression. It is also different from the problem faced by Geis et al. (2013) where the number of variables to be included was limited by the number of alternatives.

where $\hat{\beta}_l^m$ is the coefficient for variable l from the m^{th} repetition of the simulation, and the aggregate standard error is calculated as:

$$\hat{\sigma}_{\beta_l}^{Aggregate} = \left[\frac{1}{M} \sum_{m=1}^{M} \hat{\sigma}_{\beta_l^m}^2 + \left(1 + \frac{1}{M}\right) \frac{1}{M-1} \sum_{m=1}^{M} \left(\hat{\beta}_l^m - \bar{\beta}_l^{Aggregate} \right)^2 \right]^{\frac{1}{2}} \quad (8)$$

where $\hat{\sigma}_{\beta_{l,m}}^2$ is the squared standard error of the coefficient for variable l from the m^{th} repetition. The aggregate standard error thus accounts for both the average variance over all repetitions (the within-simulation variance) as well as the deviation of the estimates from their average (the between-simulation variance) and can be used for statistical inference.[10]

Two choices are crucial to the reliability of the simulation procedure: the definition of the distribution F_{bv} in step 3, where each individual in the dataset is assigned a hypothetical year of immigration, and the choice of M in step 7. Concerning the first choice, in the simplest possible case F_{bv} could be assumed to follow a $[0,1]$ uniform distribution so that each year in the period 1998–2007 is represented by an interval of equal length (e. g., $[0,0.1)$ for the year 1998, $[0.1,0.2)$ for the year 1999, etc.). Based on the value of η_i, every year would then have the same 10 % chance of being assigned to individual i. Because the inflows from sending country b_i to receiving country v_i are generally not uniformly distributed over time, the distribution is instead calculated using observed patterns of bilateral migration flows into the EU between 1998 and 2007 taken from the OECD's International Migration Database and the 2010 Revision of the UN's International Migrant Flows database (United Nations, 2011). For countries where the flows are missing in both OECD and UN data, predictions from a gravity model of migration are used (for details see appendix A). Based on the observed (predicted) distribution F_{bv} over the 1998–2007 period, individuals are thus more likely to be assigned a year where the flow of immigrants was high than a year where the flow of immigrants was low.[11]

[10] Statistical inference is based on Student's t distribution with degrees of freedom equal to (Schafer, 1999, p. 4):

$$(M-1)\left[1 + \left(\frac{1}{M}\sum_{m=1}^{M}\hat{\sigma}_{\beta_l^m}^2\right) \Big/ \left(\left(1+\frac{1}{M}\right)\frac{1}{M-1}\sum_{m=1}^{M}\left(\hat{\beta}_l^m - \bar{\beta}_l^{Aggregate}\right)\right)\right]^2 .$$

Note that Geis et al. (2013, footnote 21) use a similar calculation by taking the square root of the sum of the average squared standard error of the regressions and the variance of the estimators across specifications, which would yield a slightly smaller standard error than equation (8).

[11] To illustrate this using an example, the total number of immigrants who moved from Serbia and Montenegro to Germany between 1998 and 2007 was 332,039 according to the United Nations (2011). The largest flow was observed in 1999 (90,508 immigrants), the smallest in 2007 (13,025 immigrants). Therefore, a migrant from Serbia and Montenegro to Germany has a 27.3 % probability of being assigned the year 1999 but only a 3.9 % probability of being assigned the year 2007. Because there is no information on return migration and the EU-LFS only contains migrants who have been living in the countries under investigation in 2007, earlier years of immigration may however be overrepresented among the hypothetical years of immigration. Separate inflows by educational level are not available; it must therefore be assumed that the educational structure of inflows is relatively constant over the 10-year period considered.

Concerning the second choice, the early literature on multiple imputation advised that values for M as low as 3–10 are sufficient. However, recent evidence shows that a larger number of repetitions should be used (Graham et al., 2007; Bodner, 2008); White et al. (2011) for example propose a rule of thumb according to which the number of repetitions should be set equal to the percentage of missing observations, which suggests at most 100 repetitions. In this paper, the aggregated coefficients and standard errors are based on $M = 200$ repetitions of the simulation procedure.

The next two subsections introduce the explanatory variables in R_{ik} and C_{ik} that enter the regression model.

3.3 Institutional variables

The institutional variables capture aspects of welfare, tax, labor market and migration policy that can be expected to affect the location decisions of migrants. Because these variables hardly vary within the EU-14, they are measured at the national level and are thus included in C_{ik}. The selection of variables follows Geis et al. (2013) in order to allow a direct comparison. Summary statistics are shown in table 3.

To capture the effect of the generosity of the welfare system, the regression controls for public family expenditures as a percentage of GDP using aggregated social expenditure data from OECD (2013b) as well as the average net replacement rate over the first 60 months of unemployment (at the average wage) from the OECD Benefits and Wages Statistics. If the welfare magnet hypothesis is true, a positive effect can be expected for both variables, although migrants are usually not eligible for benefits right after arriving in the host country. The effect may, however, vary with the educational level of migrants: if low-skill migrants expect a higher probability of becoming unemployed at some point in the future than high-skill migrants, they will value a more generous unemployment security system more than highly skilled migrants. As shown in table 3, unemployment net replacement rates over the first 5 years of unemployment vary considerably across the 14 EU countries, from 5.6 % in Italy and 65.5 % in Belgium. The average net replacement rate over all 14 countries and all 10 years in the 1998–2007 interval is about 40.7 %.

In accordance with Geis et al. (2013), the regression also includes infant mortality as a proxy for the quality of the health care system (source: OECD, 2014a) as well as the PISA science scores as a proxy for the quality of the educational system. Data on PISA scores are from the OECD; because PISA scores are not available on an annual basis, the 2000 values are used for all years 1998–2001, the 2003 values are used for 2002–2004 and the 2006 values for 2005–2007.

Because welfare provisions must be financed by taxes and social security contributions, variables capturing aspects of the tax system are also included to control for the costs of living in a more generous welfare system. The regression therefore includes

Table 3: Summary statistics for institutional and control variables

Variable	Obs.	Mean	S. D.	Min.	Max.	Source
Family expenditures (as % of GDP)	140	2.342	0.928	0.800	3.800	OECD
Unemployment net replacement rate (in %)	140	40.687	17.338	5.569	65.465	OECD
Infant mortality (per 1,000)	140	4.265	0.845	1.800	6.700	OECD
PISA science scores	140	498.086	24.780	443.000	563.000	OECD
Avg. tax and SSC rate (in %, at avg. inc.)	140	30.858	7.210	19.790	44.180	OECD
$NIR(0.67,1)$	140	0.937	0.027	0.887	0.991	OECD
$NIR(1,1.67)$	140	0.907	0.027	0.856	0.960	OECD
Employment protection index	140	2.756	0.515	1.558	4.095	OECD
Trade union density (in %)	140	37.913	21.981	7.544	81.285	OECD
Index of migration policy	110	2.758	0.492	1.357	3.623	fRDB
Index of government effectiveness	140	1.645	0.494	0.214	2.357	WGI
Compensation per hour worked (in €)	2000	16.119	4.922	4.125	32.194	Camb. Econ.
Unemployment rate (in %)	2000	7.852	4.442	0.800	28.100	Eurostat
Network (in 1,000)	29,800	0.417	3.766	0.000	265.987	EU-LFS
Distance (in 1,000 km)	29,800	5.993	3.548	0.055	19.935	Own calc.
Common spoken language (= 1)	2086	0.058	0.235	0.000	1.000	CEPII
Common border (= 1)	2086	0.010	0.097	0.000	1.000	Own calc.
Colonial relationship (post-1945, = 1)	2086	0.035	0.184	0.000	1.000	CEPII

S. D.: standard deviation. SSC: social security contributions. NIR: net income ratio. See the text for more details on the data sources.

the average personal income tax and employee social security contribution (SSC) rate as a percentage of gross wage earnings measured at the average income for single persons from OECD Tax Statistics (OECD, 2014b). The combined income tax and SSC rate is chosen because it directly affects net income and is therefore one of the most important aspect of the tax system for work-related migration; a negative effect on location choice can be expected, although the effects are again likely to vary by educational attainment.

Following the results by Egger and Radulescu (2009), the regression also includes measures for the progressivity of the income tax system. Progressivity is measured using the net income ratio defined as:

$$NIR(\underline{x},\overline{x}) = \frac{1-t(\overline{x}\cdot\overline{y})}{1-t(\underline{x}\cdot\overline{y})}.$$

where $t(\cdot)$ is the function for the combined tax and SSC rate and $\overline{y}$ is average income (see Schratzenstaller and Wagener, 2009). The higher $NIR(\underline{x},\overline{x})$, the lower the level of progression. The regression includes both progression below average income $NIR(0.67,1)$ and progression above average income $NIR(1,1.67)$.[12] While the former will be especially important for the low-skilled, the latter will be more important for highly skilled migrants. The low correlation between the two measures over countries in the 1998–2007 period ($\rho = 0.239$) shows that the rates of progression vary enough to warrant separate measures.

Tax progression and average tax and SSC rates can also be interpreted as proxies for the returns to skill, and different effects can be expected for high- and low-skilled migrants: while a higher progressivity and higher tax rates will decrease the attrac-

[12] Values for the average tax and SSC rate at 67 and 167 % of average income are taken from OECD (2014b).

tiveness of a country for highly skilled migrants because they—ceteris paribus—imply lower returns to skill, they can make a country more attractive for low-skilled migrants who can profit from lower tax rates on low incomes and if higher taxes on skilled workers are used to finance public services or transfers to low-income households. In general, however, the effect of the tax level on location choices is a priori unclear: if the tax and SSC level is associated with a higher quantity (and/or quality) of public goods and services, the effect on location choices may even be positive.

As table 3 shows, the combined tax and SSC rates evaluated at the average income range from 19.8 % to 44.2 % in the 14 EU countries considered according to the OECD data, with an average over all years and countries of 30.9 %. There is also a considerable variation in net income ratios: all countries apply progressive income tax schedules, but while for example the Netherlands have (on average over all years) the lowest tax progression below average income, the UK has the lowest progressivity above average income. The highest tax progressivity on the other hand can be observed for Belgium below average income and for Denmark above average income.

The regression also controls for labor market institutions by including the employment protection index developed by the OECD (2013a). The index measures the strictness of the regulations for individual and collective dismissals. In addition, the trade union density is included (source: OECD, 2014c) because powerful unions can be assumed to be positively correlated with employment conditions and job stability. However, if there are insider-outsider problems on the labor market, both variables may decrease the attractiveness of a country for migrants. Whether a positive or a negative sign should be expected is therefore a priori unclear.

In addition to the above variables that were also included in the study by Geis et al. (2013), the regression also includes an index on the strictness of migration policy developed by the Fondazione Rodolfo Debenedetti (fRDB, 2011).[13] The index covers different aspects of migration policy and ranges from 0 to 6, with higher values representing stricter regulations. Because the index is only available for 11 of the 14 countries under consideration (there is no coverage for Belgium, Luxembourg and Sweden), the model will be estimated for only 11 of the EU-14 countries.

Finally, the regression also includes an index of government effectiveness from the Worldwide Governance Indicators (WGI) project as an additional regressor (see Kaufmann et al., 2010) that captures "perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies" (Kaufmann et al., 2010, p. 4).[14] The index

[13]Because the coverage of the index ends in 2005, 2005 values are imputed for 2006 and 2007.

[14]The WGI project also provides 5 other indicators which are, however, highly correlated with the chosen indicator.

ranges from -2.5 to +2.5 (although only values above 0.2 are observed for the 14 EU countries considered) and is included as an overall measure of governance.

3.4 Control variables

The choice of control variables follows other studies on the topic (for example Bartel, 1989; Davies et al., 2001; Nowotny, 2011; Geis et al., 2013) and includes both regional characteristics R_{ik} measured at the NUTS-2 level as well as country characteristics C_{ik} specific to origin-destination pairs in addition to regional fixed effects, which are assumed to capture all unobserved regional characteristics.

The first two region-specific attributes included in R_{ik}—the unemployment rate (in %, source: Eurostat) as well as the average income per hour worked (in Euros) at the NUTS-2 level—are intended to control for differences in economic opportunities. Data on hourly wages is calculated using information about total compensation of employees and total hours worked from Cambridge Econometrics' Regional Database. Because the characteristics in R_{ik} are truly region-specific and do not vary over decision makers, they will be imputed for the hypothetical year of immigration along with the institutional variables in the Monte Carlo simulation in order to allow their inclusion along with the regional fixed effects in the regression. While unemployment can be expected to have a negative effect on location choice, migrants can be expected to find regions attractive that feature higher wages.

Because an extensive literature shows that migrant networks play an important role in the location decision (see, for example, Bartel, 1989; Munshi, 2003; Åslund, 2005; Bauer et al., 2005; Damm, 2009, or Beine and Salomone, 2013, for a recent contribution), the regression also controls for the influence of networks by including the number of previous migrants born in the same country of origin who have been living in the migrants' region of residence for more than 10 years. The variable is thus specific to the combination of region and sending country. The number of previous migrants is calculated from the EU-LFS data at hand, which includes information on time since migration (see section 3.1). Because the (generally) positive network effect can decrease with network size (see Portnov, 1999; Heitmueller, 2006; Bauer et al., 2007), the squared network size will also be included in the regression. For migrant networks a positive effect can be expected, which may however differ between the skill levels; e. g. it can be assumed that networks play a smaller role for highly skilled migrants than for low-skilled migrants.

Finally, R_{ik} also contains the distance (in 1,000 km, measured as the crow flies) between the capital of the migrants' home country and the largest city in the region of residence and its squared value to proxy for the costs of migration (or the costs of visiting relatives at home). Distance can be expected to have a negative (but possibly nonlinear) effect on location choice, which may however differ between skill levels.

Among the variables in C_{ik} specific to sending-receiving country pairs is a dummy variable for common spoken language (= 1, zero otherwise) from Melitz and Toubal (2012). According to their data, 5.8 % of all sending-receiving country pairs in the sample share a common spoken language, and a positive effect on location decisions can be expected. Also included is a contiguity dummy assuming the value 1 if the host and home countries share a common border (zero otherwise, own calculations). Again, a positive effect can be expected because common borders facilitate not only legal, but also illegal immigration and can ceteris paribus be associated with higher migration between two countries. Colonial ties can also affect the location choice of migrants, and a dummy variable is included which captures whether two countries were in a colonial relationship after 1945 (= 1, zero otherwise; source: Mayer and Zignano, 2011). According to the data, a colonial relationship after 1945 can be found for 3.5 % of all sending-receiving country pairs in the sample, most of them with France or the UK as the former colonial power.

4 Regression results

The results of the Monte Carlo simulation of location choice are shown in table 4; the aggregate coefficients and standard errors shown in the table were calculated using formulas (7) and (8) based on $M = 200$ repetitions of the simulation procedure outlined in section 3.2. Because the index of migration policy is not available for Belgium, Luxembourg and Sweden (see section 3.3), the model was estimated for regions within the remaining 11 EU countries (EU-11) and contains region-specific fixed effects at the NUTS-2 level for 179 for the 180 regions in the EU-11 (coefficients and standard errors are not reported). As an additional indicator of the robustness of the results, table 4 also reports the fraction of repetitions where the estimated coefficient is statistically significant at the 5 % level with the same sign as the aggregate coefficient; i. e. if the aggregate coefficient is positive (negative), the fraction represents the share of repetitions where the coefficient is significantly positive (negative) at the 5 % level of significance.

Looking first at the institutional variables that measure the generosity of the welfare system, there is no robust evidence for the welfare magnet hypothesis based on family expenditures; the aggregate coefficient for public family expenditures as a percentage of GDP is positive (as in Geis et al., 2013) but not statistically significant based on the aggregate standard error, and was only significant in 5 (2.5 %) of the 200 repetitions used to calculate the effects in table 4. The interaction term is also positive, but again not statistically significant.

The coefficient of the unemployment net replacement rate on the other hand is significantly positive and is significant in 94.5 % of the repetitions; a more generous unemployment insurance thus makes a country more attractive, all else equal. The

Table 4: Simulation results for model of location choice

Countries	α/β	μ/ω
Family expenditures (as % of GDP)	0.057	0.042
	(0.320)	(0.180)
	[0.025]	[0.010]
Unemployment net replacement rate (in %)	0.030**	0.012
	(0.012)	(0.008)
	[0.945]	[0.560]
Infant mortality (per 1,000)	−0.175	0.118
	(0.140)	(0.177)
	[0.390]	[0.080]
PISA science scores	−0.008	0.005
	(0.006)	(0.006)
	[0.575]	[0.235]
Avg. tax and SSC rate (in %, at avg. inc.)	0.133***	−0.028**
	(0.047)	(0.013)
	[0.985]	[0.800]
$NIR(0.67,1)$	−6.473	−3.220
	(4.021)	(3.516)
	[0.625]	[0.125]
$NIR(1,1.67)$	14.490**	−10.024*
	(5.862)	(5.791)
	[0.945]	[0.630]
Employment protection index	0.278	−0.254
	(0.612)	(0.274)
	[0.100]	[0.195]
Trade union density (in %)	0.191***	−0.017***
	(0.054)	(0.005)
	[1.000]	[1.000]
Index of migration policy	−0.436***	−0.156
	(0.164)	(0.137)
	[0.945]	[0.060]
Index of government effectiveness	−0.218	−0.051
	(0.216)	(0.331)
	[0.255]	[0.060]
Compensation per hour worked (in €)	0.023	0.051***
	(0.051)	(0.015)
	[0.045]	[1.000]
Unemployment rate (in %)	−0.074***	0.011
	(0.019)	(0.013)
	[1.000]	[0.020]
Network (in 1,000)	0.045***	−0.015***
	(0.003)	(0.004)
	[1.000]	[1.000]
Network (in 1,000)^2	−0.000***	0.000***
	(0.000)	(0.000)
	[1.000]	[1.000]
Distance (in 1,000 km)	−0.724***	0.298**
	(0.079)	(0.148)
	[1.000]	[0.700]
Distance (in 1,000 km)^2	0.011*	−0.006
	(0.006)	(0.010)
	[0.000]	[0.000]
Common spoken language (= 1)	1.751***	−0.085
	(0.102)	(0.157)
	[1.000]	[0.000]
Common border (= 1)	0.216	1.289***
	(0.155)	(0.227)
	[0.000]	[1.000]
Colonial relationship (post-1945, = 1)	0.792***	−0.533*
	(0.153)	(0.307)
	[1.000]	[0.090]
Region-specific fixed effects	Yes	
Observations	10,262	

Coefficients and standard errors calculated using formulas (7) and (8) from $M = 200$ repetitions of the simulation procedure. α/β: coefficients of region/country specific variables; μ/ω: coefficients of interaction terms of region/country specific variables with dummy for highly skilled migrants. Aggregate standard errors in parentheses. Numbers in brackets show the proportion of estimates where the coefficient is statistically significant at the 5 % level with the same sign as the aggregate coefficient. Regression performed on weighted data using weights provided by the EU Labour Force Survey. Includes only recent migrants who moved to the EU-11 between 1998 and 2007 and who were between 25 and 64 years of age in 2007. EU-11: EU member states as of 2003 excluding Ireland, Belgium, Luxembourg and Sweden. ***significant at 1 %, **significant at 5 % and *significant at 10 % level.

interaction term of the unemployment net replacement rate with a dummy for highly skilled migrants is also positive, but there is no support for a larger effect of unemployment replacement rates on the location decisions of highly skilled immigrants: it is significant only in about half (56.0 %) of the repetitions.

Infant mortality, which is intended to capture the quality of the health care system, and the PISA science scores, which were included as a proxy for the quality of the education system, enter the regression with a negative sign, but are statistically insignificant. The coefficients of the interaction terms are in both cases positive, but again not statistically significant.

In contrast to Geis et al. (2013), the empirical analysis in this paper is not able to confirm the robust effects for family expenditures and the quality of the health and education systems using a larger set of receiving countries and after controlling for region-specific fixed effects, within-country heterogeneity and a wider array of covariates including distance, colonial relationships and common language; only unemployment benefits—which were however found to have a negative effect on location choice in Geis et al.'s (2013) estimations—lend support to the welfare magnet hypothesis. One explanation for this is that migrants of all skill levels care more about the implicit tax price of welfare benefits and public services than about the benefits themselves.

Robust evidence can be found for the effect of the average income tax and SSC rate on location decisions which is, however, positive: all else equal, a higher average tax rate increases the attractiveness of a country. For low-skilled migrants, a positive effect is consistent with Borjas' (1987) model of self-selection: a higher tax rate implies lower returns to skill and lower income inequality, and thus a system of taxation that "[...] 'insures' low-skill migrants against poor labor-market outcomes while 'taxing' high-income workers" (Borjas, 1987, p. 534). Low-skill migrants should therefore be attracted to countries that have higher average tax rates. Consistent with this interpretation the interaction term for highly skilled migrants is negative, although not large enough to cancel out the positive overall effect on location choice; therefore, a higher tax rate attracts even highly skilled migrants. One explanation for this is that despite the higher tax burden, the highly skilled value the level of public goods and services that can be financed with higher tax revenues, and it cannot be ruled out that the average tax and SSC rate provides information about the overall level (and/or quality) of public goods and services, even after controlling for some aspects of the welfare system in the regression.

The effect of the progressivity of the income tax system depends on whether progression below or progression above the mean income is considered, supporting the inclusion of two separate measures of tax progression. While the net income ratio for progression below the mean is significant at the 5 % level in only 62.5 % of the simulation repetitions and insignificant based on the aggregate standard error, the net income ratio above the mean has a significantly positive overall effect (significant in 94.5 % of the repetitions). The positive coefficient suggests that for a given average tax and SSC rate, countries with a higher net income ratio (a lower progression) above the mean are more attractive for migrants than countries with a lower net income ratio (a higher progression). Although the interaction term for highly skilled migrants is negative, it is only significant at the 10 % level and not significant at the 5 % level for more than a third of the simulation repetitions.

The regression also includes an employment protection index and the trade union density as proxies for labor market institutions. While there is not enough evidence for a robust effect of employment protection on location choices (just as in Geis et al., 2013), trade union density has a positive effect on location choices (in contrast to Geis et al., 2013). The effect is significantly smaller for highly skilled immigrants as indicated by the negative interaction term. The index of government effectiveness enters the regression with a negative sign, but is not statistically significant.

The index of migration policy, which measures the strictness of immigration laws, has a significantly negative effect on location choice: a one unit change in the index is associated with a 35.3 % decrease in the odds of choosing a country. Using the difference between the highest and lowest index values indicated by table 3 (which is about 2.3), the odds of moving to the country with the highest value are 62.8 % lower than the odds of moving to the country with the lowest value. The interaction term for highly skilled migrants is negative but significant in only 6 % of the simulation repetitions; there is thus no significant difference in the effect of migration policy between high- and low-skilled immigrants.

The control variables enter the regression with the expected signs, and most of the effects are highly robust to changes in the imputed year of immigration. The attractiveness of a region increases with hourly income, but only for highly skilled immigrants. A higher unemployment rate decreases the attractiveness of a region for all migrants. Networks of previous migrants from the same country of origin have a significantly positive effect on location choice that is, however, smaller for highly skilled immigrants and decreasing with the size of the migrant network. A similar pattern can be observed for the effect of distance which is negative, as expected, but smaller for the highly skilled. A common spoken language increases the attractiveness of a country for all migrants, while only the highly skilled prefer countries that share a border with the country of origin. Finally, the odds of moving to a country are higher if the source and target country shared a colonial relationship after 1945; the effect appears to be smaller for highly skilled immigrants but is only significant at the 10 % level.

To sum up, the regressions show that factors that have been associated with migration in the previous literature—such as earnings opportunities (wages and unemployment), costs of mobility (distance, common language, common border), networks and colonial relationships—have a robust influence on location decisions of migrants to the European Union. Among the institutional variables, the design of the income tax sys-

Table 5: Number of recent migrants to EU-14 countries by gender and skill levels

	Number of women			
	Unweighted		Weighted	
Educational attainment	*N*	%	*N*	%
N. A.	231	1.91	34,800	0.88
Low skilled (ISCED 0–2)	4,226	35.02	1,394,300	35.09
Medium skilled (ISCED 3–4)	4,685	38.83	1,592,700	40.08
Highly skilled (ISCED 5–6)	2,929	24.23	951,900	23.95
Total	12,066	100.00	3,973,800	100.00
	Number of men			
	Unweighted		Weighted	
Educational attainment	*N*	%	*N*	%
N. A.	149	1.60	26,600	0.77
Low skilled (ISCED 0–2)	3,612	38.69	1,214,900	34.97
Medium skilled (ISCED 3–4)	3,766	40.34	1,506,700	43.37
Highly skilled (ISCED 5–6)	1,808	19.37	725,900	20.89
Total	9,335	100.00	3,474,100	

N. A.: not available. Weighted numbers based on weights provided in EU-LFS and rounded to the nearest hundred. EU-14: EU member states as of 2003, excluding Ireland. Includes only recent migrants who moved to the EU-14 between 1998 and 2007 and who were between 25 and 64 years of age in 2007. Source: EU-LFS 2007, own calculations.

tem has a robust effect on location decisions. And while it cannot be excluded that the tax rate also conveys information about the general level of public goods and services and the generosity of the welfare system, only the unemployment net replacement rate provides some support for the welfare magnet hypothesis. Among the labor market institutions, trade union density has a positive effect on location choices, while stricter immigration policies lower the attractiveness of a destination.

Evaluating the differences between low- and high-skilled immigrants, the highly skilled are less attracted by higher tax rates (or the higher level and/or quality of public goods and services implied by higher taxes) and higher union densities than low-skill immigrants. Their location decisions are also less affected by networks, distance, common spoken language and past colonial relationships, and they place a higher value on wages compared to low-skill migrants. While there are thus some differences in the effects of explanatory variables between high- and low-skill immigrants, in can be concluded that their location decisions are in general driven by the same factors, albeit to a different extent.

5 Gender differences

To test whether there are gender differences in the determinants of location choices (and to assess the robustness of the empirical results), model (5) was also estimated separately for male and female migrants. A comparison between the genders is of special interest because female migrants are often considered "tied movers" that migrate although their personal benefit of migration is negative because the net benefit for the family is positive in the literature on household or family migration decisions (see Mincer, 1978, or Rabe, 2011, for a recent paper).

As shown by table 5, the share of highly skilled is higher among female migrants (23.95 %) than among male migrants to the EU-14 (20.89 %), although the share of low-skill immigrants is about the same after taking into account the weights provided by the EU-LFS; the ratio of highly skilled to low-skilled is about 0.68 for women and 0.60 for men using the weighted figures, and 0.69 and 0.50, respectively, for the unweighted figures. There are thus relatively more highly skilled women than men among migrants who moved to the EU-14 between 1998 and 2007.

For the most part, the results of the regressions by gender (see table 6) are in line with the results for the full sample in table 4, and there are only a few differences between the sexes in terms of significance levels. For example, the negative interaction term for the average tax and SSC rate is significant (at the 10 % level) for women, but slightly smaller and insignificant for men. The index of migration policy is negative in both regressions, but while it is highly significant for men, the coefficient for women is insignificant based on the aggregate standard error and significant for only 36.0 % of the repetitions, compared to 95.5 % of the repetitions for men. In addition, the interaction terms for network squared and distance are significantly positive for women but insignificant for men.

Most differences in the sign of the coefficients can be observed for cases where neither the coefficient for women nor the coefficient for men are significant: the sign of the interaction term for family expenditures is negative for women and positive for men, but insignificant for both. Similar patterns can be observed for the interaction terms of the index of government effectiveness and distance squared, and—with reversed signs—for the coefficients of hourly wages and the interaction term of common spoken language. And although there are two cases (the interaction term for the index of migration policy and the coefficient of common border) where both the sign and the significance of the coefficient differs between women and men, there is no variable whose coefficient has a different sign and is statistically significant for both sexes.

There are thus only few instances where the behavior of female migrants differs from the behavior of male migrants. For example, while the location decisions of men seem to be negatively affected by stricter immigration laws regardless of skill level, this is only true for highly skilled women. Distance seems to play a smaller role for highly skilled women (because the interaction term is significantly positive for women and almost of the same size as the coefficient of distance) than for highly skilled men, but the coefficient of common border is significant only for women, calling this conclusion into question. In summary, the regression results reveal only minor differences between male and female migrants, which not only shows that the empirical approach produces consistent results, but also that location decisions are driven by the same factors for both groups.[15]

[15]The results of this section are, however, not only consistent with the hypothesis that women are attracted by the same regional and country level characteristics as male migrants. They are also consistent with the

Table 6: Simulation results for model of location choice by gender

Countries	Women		Men	
	α/β	μ/ω	α/β	μ/ω
Family expenditures (as % of GDP)	0.092	−0.058	0.011	0.161
	(0.434)	(0.241)	(0.506)	(0.292)
	[0.045]	[0.020]	[0.030]	[0.060]
Unemployment net replacement rate (in %)	0.028*	0.009	0.035*	0.015
	(0.015)	(0.010)	(0.021)	(0.013)
	[0.745]	[0.200]	[0.715]	[0.350]
Infant mortality (per 1,000)	−0.188	0.116	−0.141	0.141
	(0.197)	(0.235)	(0.197)	(0.288)
	[0.275]	[0.080]	[0.135]	[0.070]
PISA science scores	−0.007	0.004	−0.010	0.006
	(0.007)	(0.008)	(0.008)	(0.009)
	[0.275]	[0.090]	[0.355]	[0.110]
Avg. tax and SSC rate (in %, at avg. inc.)	0.125**	−0.030*	0.143**	−0.021
	(0.062)	(0.016)	(0.069)	(0.022)
	[0.805]	[0.585]	[0.840]	[0.045]
$NIR(0.67,1)$	−5.312	−3.666	−7.504	−2.428
	(5.074)	(4.335)	(6.216)	(5.906)
	[0.335]	[0.065]	[0.350]	[0.010]
$NIR(1,1.67)$	12.992*	−11.786	17.104*	−9.166
	(7.828)	(7.228)	(9.210)	(10.087)
	[0.625]	[0.595]	[0.745]	[0.225]
Employment protection index	0.235	−0.403	0.312	−0.081
	(0.822)	(0.349)	(0.949)	(0.438)
	[0.050]	[0.295]	[0.080]	[0.015]
Trade union density (in %)	0.182**	−0.013**	0.203**	−0.024***
	(0.074)	(0.006)	(0.085)	(0.009)
	[0.960]	[0.685]	[0.925]	[0.990]
Index of migration policy	−0.242	−0.558***	−0.630***	0.292
	(0.227)	(0.174)	(0.239)	(0.216)
	[0.360]	[1.000]	[0.955]	[0.120]
Index of government effectiveness	−0.180	−0.025	−0.260	0.028
	(0.303)	(0.421)	(0.315)	(0.465)
	[0.140]	[0.040]	[0.170]	[0.030]
Compensation per hour worked (in €)	0.054	0.033*	−0.017	0.071***
	(0.071)	(0.020)	(0.076)	(0.022)
	[0.135]	[0.205]	[0.030]	[1.000]
Unemployment rate (in %)	−0.085***	0.013	−0.062**	0.008
	(0.026)	(0.017)	(0.028)	(0.020)
	[0.990]	[0.000]	[0.890]	[0.000]
Network (in 1,000)	0.045***	−0.019***	0.045***	−0.012**
	(0.004)	(0.006)	(0.004)	(0.006)
	[1.000]	[1.000]	[1.000]	[0.970]
Network (in 1,000)^2	−0.000***	0.000***	−0.000***	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
	[1.000]	[1.000]	[1.000]	[0.000]
Distance (in 1,000 km)	−0.685***	0.417**	−0.749***	0.278
	(0.115)	(0.193)	(0.110)	(0.220)
	[1.000]	[0.965]	[1.000]	[0.000]
Distance (in 1,000 km)^2	0.016*	−0.016	0.003	0.000
	(0.009)	(0.013)	(0.009)	(0.015)
	[0.095]	[0.000]	[0.000]	[0.000]
Common spoken language (= 1)	1.845***	0.155	1.702***	−0.269
	(0.134)	(0.211)	(0.159)	(0.227)
	[1.000]	[0.000]	[1.000]	[0.000]
Common border (= 1)	0.563***	1.214***	−0.212	1.616***
	(0.196)	(0.329)	(0.252)	(0.321)
	[1.000]	[1.000]	[0.000]	[1.000]
Colonial relationship (post-1945, = 1)	1.019***	−0.474	0.533**	−0.664
	(0.205)	(0.317)	(0.236)	(0.606)
	[1.000]	[0.010]	[0.960]	[0.000]
Region-specific fixed effects	Yes		Yes	
Observations	5,807		4,455	

Coefficients and standard errors calculated using formulas (7) and (8) from $M = 200$ repetitions of the simulation procedure. α/β: coefficients of region/country specific variables; μ/ω: coefficients of interaction terms of region/country specific variables with dummy for highly skilled migrants. Aggregate standard errors in parentheses. Numbers in brackets show the proportion of estimates where the coefficient is statistically significant at the 5 % level with the same sign as the aggregated coefficient. Regression performed on weighted data using weights provided by the EU Labour Force Survey. Includes only recent migrants who moved to the EU-11 between 1998 and 2007 and who were between 25 and 64 years of age in 2007. EU-11: EU member states as of 2003 excluding Ireland, Belgium, Luxembourg and Sweden. ***significant at 1 %, **significant at 5 % and *significant at 10 % level.

6 Conclusions

This paper uses the heterogeneity across EU countries and regions to analyze the economic, labor market and institutional factors that determine the location decision of migrants to the European Union. Special emphasis is given to the factors that make regions and countries attractive for highly skilled migrants vis-à-vis low-skill migrants. The regression approach is based on regional level data and takes within-country heterogeneity (e. g. in wages, unemployment levels or migrant networks) into account while controlling for region-specific fixed effects.

The empirical analysis shows that location decisions are not only determined by factors that have been identified as drivers of migration in the previous literature (such as income opportunities, networks, distance and contiguity, colonial relationships or common language), but also by institutional factors. For example, a higher income tax and social security contribution rate increases the attractiveness of a country, which may be due to higher tax levels being associated with a higher quantity and/or quality of public services and public goods. It is however also consistent with migrants' preferences for countries with lower returns to skill if there is a negative self-selection of migrants to Europe. This is supported by the finding that the positive effect of higher tax and SSC rates on location choice is smaller for migrants with tertiary education.

Migration policy also affects the location decisions of migrants to Europe, and the odds of choosing the country with the strictest migration policy are ceteris paribus 62.8 % lower than the odds of choosing the country with the most relaxed immigration policy. Looking at labor market institutions, the union density also has a positive effect on the sorting of migrants, in contrast to previous studies, while employment protection has no influence on location decisions. Concerning the welfare magnet hypothesis, the empirical analysis finds some support for the notion that a more generous welfare system is attractive for immigrants, but this is limited to only one aspect of the welfare state: while the regression shows that there is a positive effect of more generous unemployment benefits on location decisions, the empirical analysis cannot confirm findings in the earlier literature on family expenditures or the health and education systems. This may be due to using a larger set of receiving countries, but also due to differences in the empirical specification, especially the inclusion of region-specific fixed effects, controlling for within-country heterogeneity and adding a larger set of covariates. It can however not be ruled out that part of the positive effect of the welfare system was already captured by the income tax and SSC rate, which may reflect a higher level and/or quality of public goods and services. The analysis can also not confirm ear-

hypothesis that women are "tied movers": if all women in the sample were tied movers, their location decisions would in effect be driven by their partners' decisions, and as a consequence by the factors that determine their partners' location decision so that there are no (or only minor) differences in the determinants of location choice. Using the data at hand, it is however not possible to discriminate between these two interpretations of the results.

lier results on insider-outsider effects with regard to the union density and finds only minor differences in the effects of the explanatory variables between male and female migrants.

The analysis also reveals only minor differences in the effects of the institutional variables between high- and low-skilled immigrants: while the effect of the tax and SSC rate and the effect of union density are smaller for highly skilled migrants, most of the differences can be observed with respect to other variables affecting location choice: for example, wages seem to have a significantly positive effect only for high-skilled and not for the low-skilled, and highly skilled migrants' location decisions are also less affected by networks, distance and colonial relationships compared to the sorting of low-skill migrants. There is thus only limited scope for policy makers to affect the skill composition of migration by changing institutional variables.

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Appendix

A Distribution of inflows, 1998–2007

As outlined in section 3.2, the simulation procedure uses the distribution of inflows over the 10-year period 1998–2007 to assign a hypothetical year of immigration. This distribution of inflows is based on data from the United Nations (2011) for Austria, Belgium, Denmark, Finland, Germany, Greece, Italy, the Netherlands and Sweden. For France, Spain, Luxembourg, Portugal and the United Kingdom the OECD International Migration Database provides a better coverage and is therefore used instead. Of the 20,860 inflows[16], 5,544 (26.6 %) are however unobserved in both data sets; for example, data for Greece is only available for 2007, Swedish data are only available from the year 2000 on, Italian data are complete only for a few (larger) sending countries, etc.

To fill in the missing data, a gravity model of migration is estimated which is then used to predict and fill in the unobserved flows. As regressors, the gravity model includes the log of GDP per capita (calculated from GDP figures at constant 2005 US$ provided by the United Nations' National Accounts Main Aggregates Database and population figures from United Nations, 2013), the unemployment rate (from Eurostat) and networks of migrants from the same country of birth (calculated at the country level from the EU-LFS data as described in section 3.4) in the target country, dummy variables for common border, common spoken language and a colonial relationship after 1945 (from CEPII, see Melitz and Toubal, 2012), distance (as the crow flies between the capitals of both countries, own calculations in 1,000 km) and distance squared. Furthermore, the regression includes destination and origin-year fixed effects, as suggested by Ortega and Peri (2013) and Beine et al. (2014, p. 19). Following Santos Silva and Tenreyro (2006), the gravity model is estimated using Poisson pseudo-maximum-likelihood (PPML).

The results are shown in table A1. All of the included variables have the expected sign: a higher (log) GDP per capita in the destination is associated with larger migration flows, as are networks, a common border, a common spoken language and a colonial relationship after 1945. The unemployment rate in the destination is negatively associated with migration; the effect of distance on migration is negative, but nonlinear. Based on the migration flows observed in the UN and OECD data and the migration flows predicted from the gravity model, the cumulative distribution of immigration over the period 1998–2007 is calculated for each combination of origin and destination countries, which is then used in the Monte Carlo simulation to assign hypothetical years of immigration.

[16]The gravity model was estimated for flows from the 149 sending countries into all EU-14 countries in the 1998–2007 interval, although only 11 EU receiving countries were used in the actual estimation.

Table A1: Gravity model of migration, PPML estimation

Dependent variable: number of migrants	$\hat{\beta}$
Destination log GDP per capita (in 1,000 constant 2005 US$)	6.457***
	(1.495)
Destination country unemployment rate (in %)	−0.220***
	(0.022)
Network (in %)	0.025***
	(0.001)
Common border (= 1)	0.530***
	(0.137)
Common spoken language (= 1)	0.484***
	(0.083)
Colonial relationship (post-1945, = 1)	0.270***
	(0.084)
Distance (in 1,000 km)	−0.616***
	(0.085)
Distance^2	0.017***
	(0.005)
Constant	−17.066**
	(6.855)
Destination fixed effects	Yes
Origin-year fixed effects	Yes
Observations	15,316
R-squared	0.832

PPML: Poisson pseudo maximum likelihood. Coefficients of destination and origin-year fixed effects not reported. Robust standard errors in parentheses. * significant at 10 %, ** significant at 5 %, *** significant at 1 % level.

Project Information

Welfare, Wealth and Work for Europe

A European research consortium is working on the analytical foundations for a socio-ecological transition

Abstract

Europe needs change. The financial crisis has exposed long-neglected deficiencies in the present growth path, most visibly in the areas of unemployment and public debt. At the same time, Europe has to cope with new challenges, ranging from globalisation and demographic shifts to new technologies and ecological challenges. Under the title of Welfare, Wealth and Work for Europe – WWWforEurope – a European research consortium is laying the analytical foundation for a new development strategy that will enable a socio-ecological transition to high levels of employment, social inclusion, gender equity and environmental sustainability. The four-year research project within the 7th Framework Programme funded by the European Commission was launched in April 2012. The consortium brings together researchers from 34 scientific institutions in 12 European countries and is coordinated by the Austrian Institute of Economic Research (WIFO). The project coordinator is Karl Aiginger, director of WIFO.

For details on WWWforEurope see: www.foreurope.eu

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