

# Education Policies and Migration across European Countries<sup>\*</sup>

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## Abstract

Two features - a large share of individuals with secondary education who display low migration rates and the variety of national languages - might explain why labor mobility across European countries is lower than across US states. This paper tests whether and how differences in education policies effect migration across Europe. We focus on two policies: (i) increasing the length of compulsory education and (ii) introducing foreign languages into compulsory school curricula. The former shifts educational attainment for a significant fraction of the population from low towards medium levels. Using cohort data on migration flows across European countries we find that an additional year of compulsory education decreases the propensity to migrate by 17%. This is in line with higher emigration rates of low educated individuals compared to medium educated in the majority of European countries, and with a model in which transferring education across countries is costly. On the other hand, introducing a foreign language into compulsory school curricula more than doubles the likelihood to migrate to the country where the language is spoken. Depending on the specific content of an education policy, “more education” can thus have very different implications for an individual’s propensity to migrate.

*JEL classification:* J61, I20, F22

*Keywords:* migration, compulsory schooling, language proficiency, return to skills, education

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# 1 Introduction

Since 2008 and the beginning of the global economic crisis the trend of converging unemployment rates within the European Union has come undone, particularly affecting regions in Southern Europe. In 2011 almost one half of all employable youth in Spain and Greece were unemployed while in contrast the Netherlands had the lowest youth unemployment rate, with less than 10% of young individuals without a desired job (see Figure 1.1). Given basically unrestricted migration within the EU one would expect to observe, in particular young individuals, to migrate from countries with high unemployment rates to those with low rates.<sup>1</sup> European migration has shown some response to the crisis - see Jauer et al [2014] and Figure A-1 of the Appendix on the recent increase in migration from Greece, Portugal, and Spain to Germany. But overall labor mobility across EU countries remains limited, unlikely to significantly reduce unemployment differentials of 40 percentage points. According to the OECD, annual migration rates across EU countries were around 0.3% in 2010 while US state-to-state migration rates were around 2.4%.<sup>2</sup>

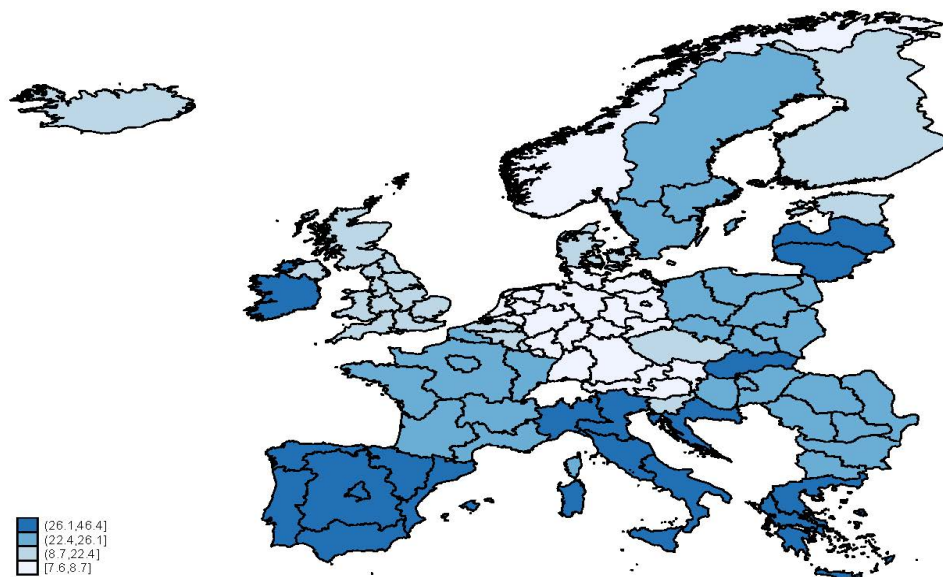
A variety of explanations for these differences in mobility rates have been suggested by literature, ranging from multiple languages (Bartz and Fuchs-Schündeln [2012]), relatively high unemployment benefits (Antolin and Bover [1997]), lower educational attainment (Machin, Salvanes and Pelkonen [2012]) to stronger employment protection (Belot [2007]). The current paper focuses on two of these features: educational attainment and language barriers. A large share of individuals with secondary education who display low migration rates and the variety of national languages might explain why labor mobility across European countries is relatively low. We test whether and how across-country-and-time differences in education policies effect EU migratory movements. In particular, we consider two policies: (i) increasing the length of compulsory education and (ii) introducing foreign languages into compulsory school curricula. Using cohort data on migration flows across European countries, we find that additional years of compulsory education decrease the propensity to migrate. On the other hand, introducing a foreign language into compulsory school curricula increases the likelihood to migrate to the country where the language is spoken. Depending on the specific content of an education policy, “more education” can thus have very different implications for an individual’s propensity to migrate.

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<sup>1</sup>EU law guarantees free labor mobility but countries can impose temporary restrictions for nationals of new member states. Currently and until June 30th 2015, thirteen member states require that Croatian nationals obtain work permits (see European Commission).

<sup>2</sup>Differentials in US youth unemployment rates are much smaller, ranging from 7.8% in North Dakota to 28.5% in Rhode Island (Bureau of Labor Statistics). US migration rates are about twice as large as within-country migration rates in most European countries (see Gáková and Dijkstra [1995]) with the exception of Scandinavian countries and Great Britain, see Molloy et al [2011].

Figure 1.1: Youth Unemployment Rates (< 25 years) across Europe, 2011



Data: Eurostat

Educational attainment and foreign language proficiency are determined by individual decisions which can in part be influenced by the desire to migrate. For instance, McKenzie and Rapoport [2011] find that Mexican boys from a household with international migration experience are more likely to drop out of school. Hence, simple correlations between educational attainment and migration, and language proficiency and migration will be biased estimates of the causal effect on migration. This is why, similar to other works in the literature, the current paper uses laws that regulate the length and content of compulsory education which cause an exogenous variation in the education acquired by the population. In particular, additional years of compulsory education shift the educational attainment for a significant fraction of the population from low towards medium levels. If the propensity to migrate differs along educational attainments, increasing the length of compulsory education can potentially have sizeable effects on migration. Our analysis thus also highlights how certain education policies can affect migration decisions and ultimately influence convergence across EU countries.

For our analysis we use Eurostat data on migration flows across EU countries by cohorts.

To the best of our knowledge this is the only available comprehensive data set on migration flows by age groups. We complement our data with information on changes in the length of compulsory schooling which occurred during the 20th century and thus affected our cohorts. Our database also includes information on the introduction of foreign languages into compulsory school curricula. Our empirical strategy compares migration decisions of individuals: (i) of different cohorts from the same country who were exposed to different educational policies due to policy changes, (ii) from different countries but of the same cohort who were exposed to different educational policies because of differences in legislation in the two countries. Controlling for economic and historical variables (years lived under communist rule) in countries of origin and destination, the presence of other co-nationals, and total population by age group we find that increasing compulsory schooling by one year decreases the propensity to migrate by 17%. Introducing a foreign language into compulsory school curricula, on the other hand, more than doubles the likelihood to migrate to the country where the language is spoken.

A number of recent studies have used changes in education laws and related policies to instrument for education choices when estimating the causal effect of education on within-country migration. Machin, Salvanes and Pelkonen [2012] use a change in compulsory schooling laws in Norway and establish that more education leads to higher geographical mobility. The paper by Malamud and Wozniak [2010] finds heterogeneous results for US migration. Using the risk of being drafted for the Vietnam War as an instrument for college-level education, the authors estimate a positive causal effect of education on internal US migration. However, when instrumenting education by quarter of birth they do not find any significant effect. These findings could be due to the fact that additional years of schooling might have different effects depending on baseline educational attainment, being positive only for higher levels of education. The analysis by McHenry [2012] on migration across US states supports this interpretation. The author uses differences in changes in the minimum school leaving age across US states and shows that for low levels of education additional attainment has a negative impact on migration. In the context of international migration most studies use observed educational attainment, and many focus on the case of Mexican-US migration. Results from these studies range from negative self-selection of Mexican immigrants (Borjas [1987], Fernández-Huertas Moraga [2011]), to an inverse u-shape with larger shares of medium educated migrating (Chiquiar and Hanson [2005]), to self-selection that depends on immigrant network intensity (McKenzie and Rapoport [2010]).

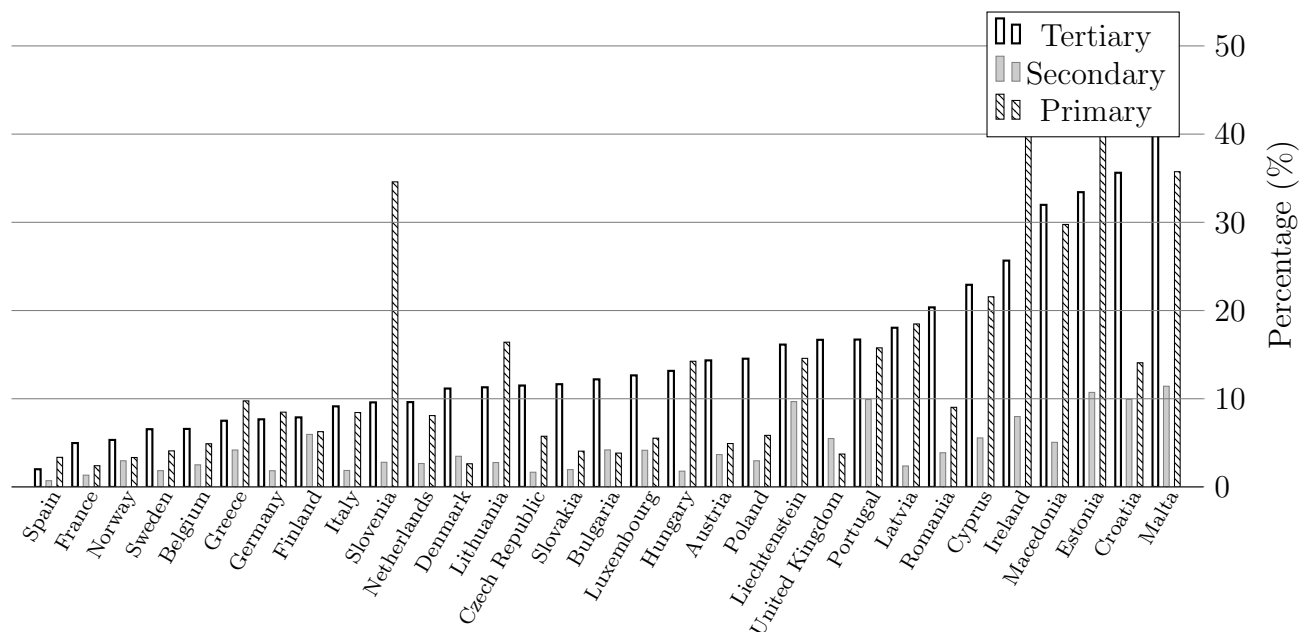
To the best of our knowledge we are the first to use a multi-country setting and to analyze how education policies affect international migration. This is relevant in so far as findings on education policies and internal mobility cannot be simply extrapolated to the context

of international migration. Within a country, educational attainment is easily transferable but education obtained in one country might not necessarily be fully recognized in another country (see Chiswick [1978] or Greenwood and McDormell [1991]). Furthermore, without the necessary language skills, education obtained in one country is of much lower value in another country. Given basically unrestricted mobility within the EU on the one hand, and a large variety of different languages spoken across Europe on the other hand, the EU setting allows us to isolate the role of education policies from migration restrictions in a context where language proficiency is relevant for migration.

In contrast to the United States, many different national languages are spoken across Europe. For migrants within Europe, speaking a foreign language increases returns to migration because it determines the degree to which their human capital is transferable across countries. Hence, foreign language proficiency is likely to shape their migration decisions. While acquiring foreign languages is an individual decision, according to the Eurobarometer 68% of Europeans obtained their language skills at school. For students in most EU countries - with the exception of Ireland - learning a foreign language is not an individual decision, but part of compulsory education. More than 80% of students study English as a foreign language and in most countries a second language - typically French, German, or Spanish - is compulsory (see Figure A-2 of the Appendix).

Regarding migration across countries and foreign language proficiency, the existing literature has mainly focused on two important aspects: its determinants and its consequences for migrants (see e.g. Bleakley and Chin [2010], Chiswick and Miller [2010], and Dustmann and Fabbri [2003]). We propose a different perspective that has received relatively little attention so far: how ex-ante language skills influence individuals' decisions to migrate. Among the few related works are Chiswick and Miller [2001] and Adsera and Pytlikova [2012]. The former show that immigrants from former colonies tend to be more proficient in the host country's language. Adsera and Pytlikova [2012] try to explain migration flows to different OECD countries using linguistic distances to measure the ease of learning a host country's language. The analysis on foreign language proficiency and migration in the current paper is similar to the one we carried out in Aparicio Fenoll and Kuehn [2014], but includes more countries, additional years, and a broader set of controls. In addition, the current paper extends the analysis to a broader set of education policies. Our measure for differences and changes in compulsory education shows a robust correlation with actual average years of schooling as measured by Barro and Lee [2010]. Hence, our results also shed some light on the more general question of the effect of educational attainment on migration.

Figure 1.2: Emigration rates by educational attainment, 2010



Source: Brücker, Capuano, and Marfouk [2013]; primary: no schooling, primary and lower secondary; secondary: high-school leaving certificate or equivalent; tertiary: higher than high-school leaving certificate or equivalent

In most European countries, the relationship between education and migration displays a u-shaped pattern. Individuals with secondary educational attainment are less likely to migrate than those with primary and tertiary levels. Figure 1.2 displays emigration rates for 2010 by educational attainment for 31 European countries estimated by Brücker, Capuano, and Marfouk [2013].

With the exception of Denmark, Bulgaria, and the United Kingdom (UK), individuals with secondary educational attainment display lower emigration rates compared to primary and tertiary educated. Migration rates across US states on the other hand, are increasing in education and particularly high for tertiary educated, see Hernández-Murillo et al [2011]. Furthermore, with the exception of Cyprus and Ireland, more than 60% of all young (20-34) Europeans have at most secondary education. On the other hand, this is the case for only 40% of young US individuals while 60% have some college education, see Figure A-3 of the Appendix.

These numbers suggest that the low propensity to migrate of secondary educated individuals who make up an important fraction of the young European population could explain the lower EU migration rates. But why would secondary educated individuals be less

likely to migrate? If transferring education across countries is costly and wages are increasing in education then it will only be optimal for certain skill groups to migrate. In the next section we present such a model that is able to rationalize the u-shaped relationship between education and migration. The remainder of the paper is organized as follows: Section 3 describes our data. In Section 4 we present our estimation strategy. Section 5 presents and discusses our results, and Section 6 concludes.

## 2 Model

According to the traditional framework of the Roy model [1951] applied to the context of migration, individuals decide to migrate upon comparing their expected incomes in origin and destination countries. Differences in returns to education across countries determine whether the propensity to migrate (change occupations) is higher for low or highly educated individuals. However, a simple Roy model [1951] with wages monotonously increasing in education and fixed migration costs (independent of the education level) cannot generate the observed u-shaped relationship between education and migration displayed in Figure 1.2. A model that allows for heterogeneous effects of education on migration and that has the potential to generate the observed pattern is the one suggested by Stark [1991].<sup>3</sup> We adapt his model and illustrate how increases in educational attainment and improvements in foreign language proficiency driven by education reforms might affect migration.

Consider two countries; one richer  $R$  and one poorer country  $P$ . Expected wages in each country depend on the individuals' level of education  $\theta$ . We assume the following functional form for expected wages:

$$W_R(\theta) = r_0 + r_1\theta$$

$$W_P(\theta) = p_0 + p_1\theta,$$

where  $r_0 > p_0$  and  $r_1 > p_1$ .<sup>4</sup> Because of lower language proficiency  $k \in [0, 1)$ , migrants have lower expected wages than natives with comparable educational attainments.

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<sup>3</sup>Caponi [2010] proposes a model where transferability of human capital is limited across countries but parents migrate for a better education of their children. His model also generates a u-shaped relationship between education and migration.

<sup>4</sup>Note that these parameters also incorporate aspects that affect differences in the probability of finding a job, e.g differences in unemployment rates.



Medium to high values of language proficiency,  $k$  imply that for individuals of any educational level, expected wages in country  $R$  are higher than those in country  $P$ , i.e.

$$kW_R(\theta) > W_P(\theta).$$

However, educational attainments obtained in one country are not automatically recognized elsewhere. In order to obtain a degree recognition valid in a foreign country, individuals have to pay a time and money cost  $C$ . A prerequisite for degree recognition is to hold a degree that can potentially be recognized in other countries: high school diploma, college degree, apprenticeship, etc. Hence, individuals with very low educational levels cannot opt for degree recognition. Secondly, degree recognition requires official translations and bureaucratic paperwork requested by government agencies, associations, and guilds. Individuals' net income in the foreign country after the process of degree recognition is thus given by  $kW_R(\theta) - C$ . Individuals can also migrate without a recognized degree. In this case they are only able to make minimum wage,  $k\bar{W}_R$ .<sup>5</sup>

The upper graph of Figure 2.3 displays a possible relationship between expected wages in country of origin and destination country. Given certain parameter values, a u-shaped relationship between educational attainment and migration arises.<sup>6</sup> Those with low educational attainment - with  $\theta < \theta_2$  - migrate without having invested in degree recognition and they make minimum wage  $k\bar{W}_R$ . Individuals with a medium level of education - between  $\theta_2$  and  $\theta_1$  - do not migrate and they make  $W_p(\theta)$ . Finally, those with higher educational attainments ( $\theta > \theta_1$ ) invest in degree recognition, migrate, and earn  $kW_R(\theta) - C$ . An increase in the length of compulsory education shifts a mass of individuals from low educational attainment towards medium education. A shift in the distribution of educational attainment towards a different distribution with a higher mean and smaller variance as displayed in the lower graph of Figure 2.3 could be expected. This leads to an increase in the share of individuals who decide not to migrate. In our example, the difference between the light and dark gray area indicates the additional mass of individuals who decide to stay in their home country.

As language proficiency increases from  $k$  to  $k'$  migrants with better language skills are able to obtain wages more similar to those of natives. Figure 2.4 shows what would happen in such a case.

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<sup>5</sup>This simple static model abstains from improvements in language proficiency once the individual has migrated, nor does it allow for return-migration. Reinhold and Thom [2013] propose a model of return migration where individuals' migration decisions also take into account the potential increase in income back home, something that could in part be due to language acquisition.

<sup>6</sup>Parameter values for Figures 2.3 and 2.4 are chosen such that  $C = kr_0$ .



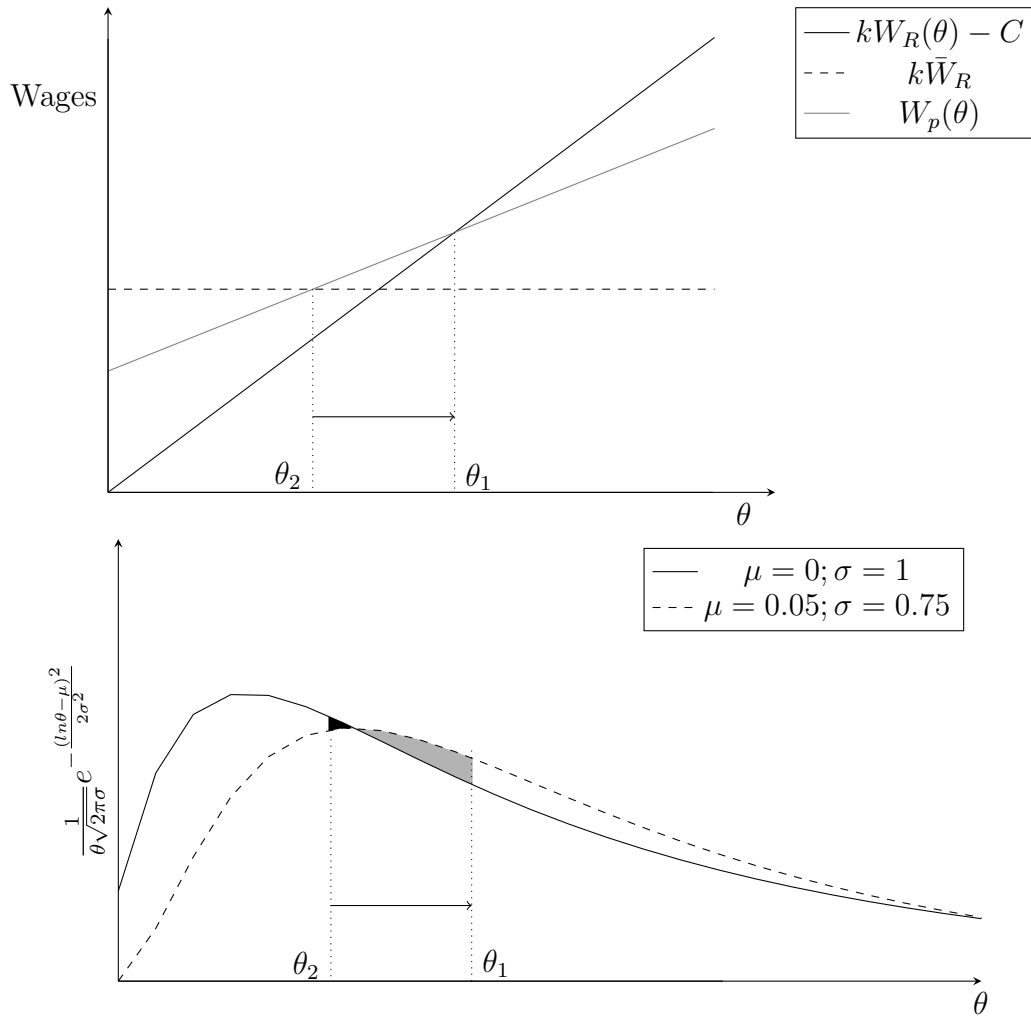


Figure 2.3: Effect of increase in length of compulsory education on migration

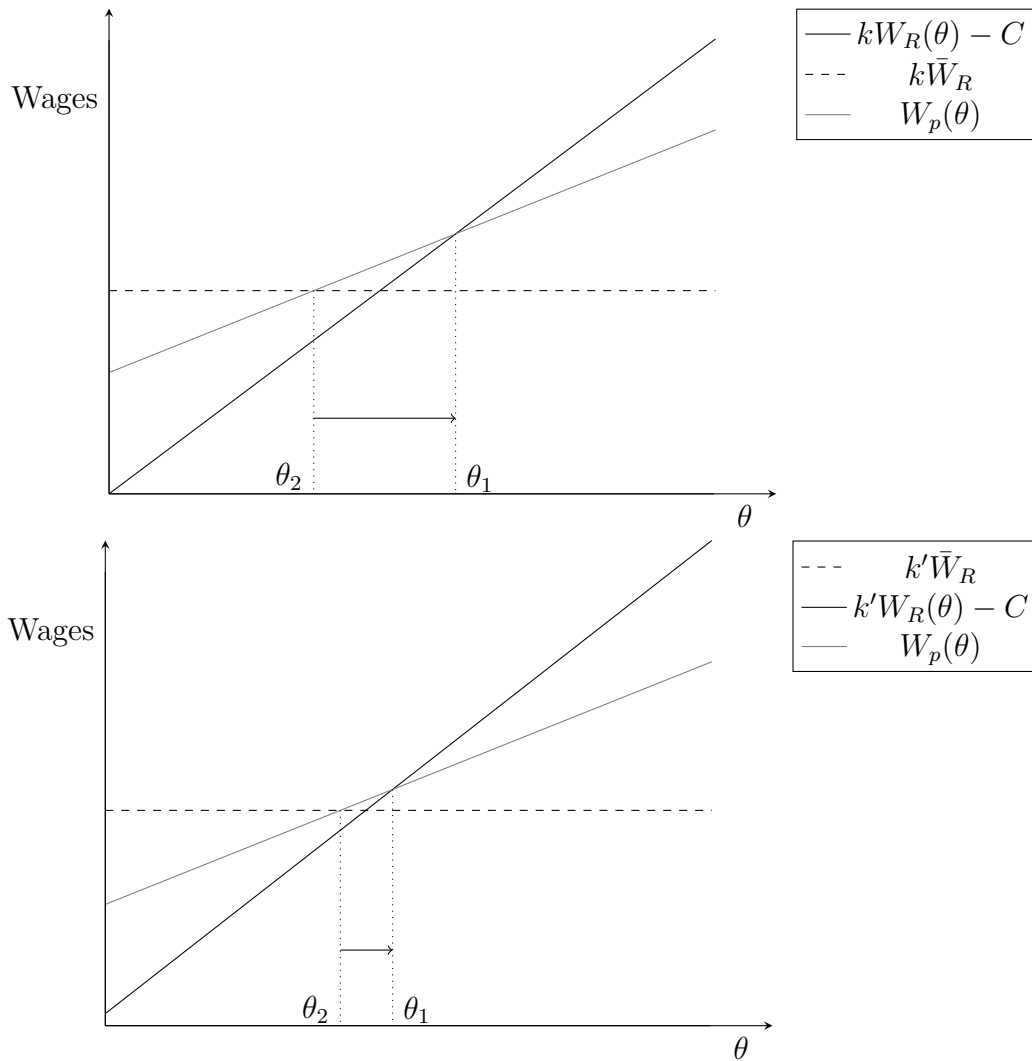


Figure 2.4: Effect of improvement in language proficiency from  $k$  to  $k'$  on migration.

An increase in language proficiency  $k$  implies higher expected wages in the foreign country, both for those who migrate without degree recognition as well as for those who invest in degree recognition. However, in line with findings in literature we assume the increase in expected wages to be stronger for high educated individuals in skilled professions (see McManus, Gould, and Welch [1983], McManus [1985], Mora and Davila [1998] and Carliner [1996]). The minimum wage increases to  $k'\bar{W}_R$  and the intercept and the slope of the expected wage function for those with recognized degrees  $k'W_R(\theta) - C$  increase as well. As a result fewer individuals decide to stay in the home country. An increasing number of highly educated migrate with a recognized degree but also more low educated who do not invest in degree recognition and who expect to earn a higher minimum wage migrate. The model thus has the power to predict that given certain differences in wages across countries, an increase in the length of compulsory education can reduce migration while the introduction of foreign languages in compulsory school curricula leads to more migration.

Ideally one would want to first analyze differences in expected wages for individuals of different educational attainment and across countries prior to testing the model's predictions of changes in education policies on migration. However, differences in expected wages while typically included in estimations of internal migration decisions - see Kennan and Walker [2011] for the United States - are usually not available for analyses of international migration. One exception is Bertoli, Fernández-Huertas Moraga, and Ortega [2013] who consider migration from one origin country, Ecuador, to two destination countries, Spain and the United States. Our analysis extends to migration across all EU countries which leaves us with more than twenty origin and destination countries. In this context, comparable micro data on wages is not available. We can thus only test the model's predictions for migration decisions under different educational policies regarding length of compulsory education and foreign language learning.

### 3 Data

For our analysis we use Eurostat's database on migration across EU countries. In particular, we consider the flow in  $t$  and stock of immigrants in  $t - 1$  by 5-year age groups in destination countries in 2008-2012. Destination countries that provide this data are the following 26 countries: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Netherlands, Norway, Poland, Romania, Slovakia, Slovenia, Spain, and Sweden. For Germany and Austria, data for 2009-2012 and 2010

respectively is missing and we complement it with data from the Statistisches Bundesamt and Statistik Austria. Data for the UK come from the International Passenger Survey provided by the Office for National Statistics (ONS). Note that data for migration flows to France, Greece, Malta, and Portugal is not available. Hence, we have information on 27 destination countries and 31 countries of origin - all destination countries plus France, Greece, Malta, Latvia, and Portugal. Eurostat also provides information on unemployment rates by age groups. For our analysis we only consider individuals between 25 and 44. To avoid picking up temporary migration related to studying abroad we restrict our sample to individuals of working age ( $> 25$  years). In many countries for individuals older than 44 (born before 1964) it is unclear that language learning (or even compulsory schooling) was enforced. We combine data on the length of compulsory schooling reforms from four sources: United Nations (UN) Data, Eurybase (the Eurydice database on education systems in Europe), Brunello, Fort and Weber [2009] and Murtin and Viarengo [2011]. We then construct a database with information on the required years of compulsory education for each cohort in each country. Educational reforms that changed the length of compulsory education during the 20th century altered the minimum educational attainment of individuals from different cohorts. Such changes generate within- and across-country variation in the minimum educational attainment.

Our data on exposure to foreign languages in compulsory education come from the European Commission's Education, Audiovisual and Culture Executive Agency (EACEA). In addition, we use data from the European's Commission's Directorate-General for Education and Culture to construct a database including information on the starting age for studying foreign languages during compulsory education. Educational reforms that have occurred during the last decades imply that individuals of different cohorts may have been exposed or not to foreign languages during compulsory education. There are also differences in the choice of foreign languages studied over time. For instance, in Spain French used to be the first foreign language studied during secondary education. Three decades ago however, students began studying English as the first foreign language. In most former communist countries of Central and Eastern Europe, Russian has been replaced by English as the first foreign language. These changes generate within- and across-country variation in the exposure to foreign languages. Our data set contains this information by age group and country of origin.

During lower and upper secondary education (levels 2 and 3 of the International Standard Classification of Education designed by the United Nations) students in EU countries study on average 1.5 foreign languages. More than 80% of students in EU countries study English as a foreign language, with the exception of Portugal (see Figure A-2 of the Appendix). Regarding the study of a second foreign language, in most countries learning

French, German, or Spanish is compulsory. German is more common in Central and Eastern Europe, while French tends to be taught in Southern European countries.<sup>7</sup> In Germany, Spain, UK, Ireland, and Norway studying a second foreign language is not compulsory.<sup>8</sup>

Our age restriction implies that individuals in many countries were exposed to English as a first foreign language. In Central and Eastern Europe - with the exception of Romania and Slovenia where Russian was not the first compulsory foreign language- the change from Russian to English as the first foreign language was clearly driven by the end of communism, which in itself had important implications for migration flows. Given that we consider migration in years 2008-2012, most of the initial emigration boom is likely to have ebbed out. Even if that were not the case, in our estimation we compare migration decisions of individuals who were and those who were not exposed to English as a foreign language. If the end of communism were still the main driving force for migration in 2008-2012, then - controlling for differences in age - we should not observe any differences in migration decisions between the two groups. For instance, comparing two individuals from the same ex-communist country, one born in 1980 and another one born in 1977, the former was exposed to English as a foreign language while the latter was not. If both individuals migrated to the UK or Ireland origin-destination-fixed effects would capture their decision, and it would not add to our estimated effect of language proficiency on migration. Only in case the younger, but not the older individual migrated to the UK or Ireland would we attribute his migration decision to the newly acquired English skills. In order to account for this additional effect we include a control variable for the number of years a cohort lived under communist rule. As mentioned before, exposure to compulsory second foreign language differs across countries. The most widely taught second foreign languages in Europe are French, German, and Spanish. Italian is taught in fewer countries. We also take into account that there are countries where studying a second foreign language is not part of compulsory education, and that students in Finland learn Swedish as a foreign language.

Table 3.1 provides summary statistics - mean, standard deviation and minimum and maximum values - for our variables. We have observations for 11,205 combinations of origin\*destination\*age\*year.<sup>9</sup> Around 221 individuals in each age group from each country

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<sup>7</sup>In many countries, Spanish is the third or fourth most widely taught second foreign language. The same holds true for Italian, but in fewer countries.

<sup>8</sup>In Germany, learning a second foreign language is only compulsory for students who attend the type of upper secondary education that provides access to universities (“gymnasiale Oberstufe”).

<sup>9</sup>In total we should have 14,500 observations. Unfortunately, we were not able to complement the following missing data: destination countries France, Greece, Malta and Latvia, for Belgium data for 2008-

of origin migrate each year to one of the destination countries. However, there is large variation. Individuals from some age groups and countries of origin do not migrate to certain countries. On the other hand, the inflow of individuals from some age groups and countries of origin is 130 times more common compared to the mean. In particular in 2008, 29,250 individuals 25-29 years old migrated from Romania to Italy.

Table 3.1: Summary statistics

Variable	Mean	Std. Dev.	Min.	Max.
imm inflow origin-destination by age	221.199	1015.603	0	29250
years of compulsory education	9.473	1.144	6	13
exposed to foreign language	0.091	0.285	0	1
age group 25-29	0.252	0.434	0	1
age group 30-34	0.252	0.434	0	1
age group 35-39	0.249	0.432	0	1
age group 40-44	0.248	0.432	0	1
year: 2008	0.224	0.417	0	1
year: 2009	0.183	0.387	0	1
year: 2010	0.193	0.395	0	1
year: 2011	0.195	0.396	0	1
year: 2012	0.205	0.403	0	1
diff. unemploy. origin -destination by age	0.474	5.949	-27.2	33.1
stock imm origin-destination by age	1796.978	10279.171	0	324571
stock population in origin by age	1182331.963	1603305.056	2224	7176550
years under communist rule	4.845	7.474	0	23.5

N=11205; Differences in unemployment rates and the stock of immigrants refer to years  $t - 1$ , i.e 2007, 2008, 2009, 2010, 2011. Sources: Eurostat, Statistisches Bundesamt, Statistik Austria, ONS, UN Data, Eurybase, European Commission's Education, Audiovisual and Culture Executive Agency (EACEA), European's Commission's Directorate-General for Education and Culture; own calculations

The average number of years of compulsory education is 9.5. Years of compulsory education range from 6 (for older cohorts in most countries) to 13. Around 9.1% of our observations - cells defined by the combination of origin, destination, age, and year - are exposed to the language of the destination country during compulsory education. We have four age groups and observations are distributed homogeneously across them, such that there are 25% of observations in each group. We have slightly more observations for

09, Bulgaria 2009-11, Croatia 2009-10, Cyprus 2009-12, Macedonia 2009-10, Poland 2009-12, Portugal 2009-12, Slovakia 2012. The remaining missing data refers to single observations, for instance for half of all countries migration from Liechtenstein is missing.

2008 than for 2009-2012. Regarding differences in unemployment rates by age groups we observe the maximum difference of 33 percentage points between unemployment rates in Norway and Greece for individuals aged 25-29 in 2012. Measured one year before migration, the average number of immigrants of a certain age group and from a certain country of origin is around 1,797, i.e. more than eight times the average annual inflow. In some countries there are no immigrants of a specific age group from a certain EU country, while there were 324,571 immigrants from Poland aged 40-44 in Germany in 2011. On average there are a little over 1 million individuals per age group in each country of origin, ranging from only 2,224 individuals of age 25-29 in Luxembourg and Liechtenstein, to more than 7 million British and Germans of age 40-44. Finally, we calculate the average number of years lived under communist rule by a cohort as the difference between the cohort's birth year and 1990.

## 4 Estimation Strategy

The validity of our identification strategy relies on exploiting all dimensions of variation in the data. We could have estimated the effects of education policies on migration by comparing individuals of different ages from the same country and exploiting that those individuals would be affected by different compulsory schooling laws. However, such an estimation would be affected by differences in the propensities to migrate by age. Another alternative would have been to compare individuals of the same age from different countries. However, nationals of different countries have different propensities to migrate to any other country, independently of education policies. A third potential approach would have consisted in comparing individuals of the same age and country of origin but observed at different points in time. However, migration patterns differ across time even if education policies stay the same. We improve upon these alternative approaches by combining them and comparing individuals across age, countries of origin, and time. This strategy allows us to control for confounding factors that vary with age, time, and country of origin, and their pairwise combinations (age and time, age and country, time and country). Moreover, in our estimation of the impact of compulsory foreign language courses we make use of the fact that our explanatory variable varies also by destination country, and we introduce destination country as an additional dimension. As a result, our estimated coefficients result from refined comparisons of cohorts and they are robust to the potential influence of a long list of unobserved factors.

To assess the impact of education policies on migration we estimate two separate models. Our first model considers the number of migrants in a cohort as a function of the number



of years of compulsory education. The second model estimates the number of migrants explained by exposure to compulsory foreign language courses in the language of the destination country. Regarding our first model, we estimate the effect of compulsory education on the number of migrants assuming the following linear form for the relationship between the two variables:

$$M_{a,o,d,t} = \alpha_0 + \alpha_1 CS_{a,o,t} + \alpha_2 D_a + \alpha_3 D_o + \alpha_4 D_d + \alpha_5 D_t + \alpha_6 D_{a,o} + \alpha_7 D_{a,d} + \alpha_8 D_{a,t} + \alpha_9 D_{o,d} + \alpha_{10} D_{o,t} + \alpha_{11} D_{d,t} + \alpha_{12} X_{t-1} + \epsilon_{a,o,d,t} \quad (4.1)$$

where  $M$  is the number of immigrants of age  $a$  from country  $o$  going to country  $d$  in year  $t$ .  $CS$  denotes the number of years of compulsory education faced by individuals in cohort  $a$  in year  $t$ , and  $D_s$  with  $s = a, o, d, t$  are dummies for age, country of origin, destination country, and year. Our basic model includes all four dummy variables.

We then expand the model to include all simple interactions as well as certain double interactions of dummy variables. For instance, we add the interaction term  $D_{d,o,t}$  between destination country, country of origin, and year. This term accounts for pull and push factors between countries that change over time and that are common to all cohorts of immigrants from the same country of origin. Including these dummy variables is equivalent to including control variables from typical gravity models like differences in the share of young individuals in the labor force, female labor force participation rates, or average wage differentials (see e.g. Ortega and Peri [2009] or Lewer and Van den Berg [2008]). In particular, prior to 2009 or 2011, nationals of Central European countries that joined the EU in 2004 and 2007 respectively, faced some restrictions regarding work permits. Croatian nationals also faced restrictions on residence prior to 2013. In our estimations, destination, origin, and time fixed effects will account for these aspects. We also include the interaction term  $D_{d,a,t}$  between destination country, age group, and year, to take into account any age-specific changes in the labor demand of the destination country. Moreover, to control for network effects and economic factors we include as control variables ( $X_{t-1}$ ) total population in country of origin, stock of immigrants by country of origin, and differences in the unemployment rates between the destination country and the country of origin, all lagged and by age group.

Note that for those countries that did not introduce any changes to the length of compulsory schooling during the time our cohorts were at school, the variable  $CS_{a,o,t}$  is a constant. As a result,  $D_{a,o}$  will not be identified. However, as long as identifying these dummy variables is not the focus of our analysis this will not pose a mayor problem for our estimation. Following Bertrand et al [2004], we cluster standard errors at the destination-origin-age level to allow for serial correlation in migration flows over time.

In our second model, we assume that the number of migrants depends on exposure to compulsory foreign language courses as follows:

$$M_{a,o,d,t} = \beta_0 + \beta_1 L_{a,o,d,t} + \beta_2 D_a + \beta_3 D_o + \beta_4 D_d + \beta_5 D_t + \beta_6 D_{a,o} + \beta_7 D_{a,d} + \beta_8 D_{a,t} + \beta_9 D_{o,d} + \beta_{10} D_{o,t} + \beta_{11} D_{d,t} + \beta_{12} X_{t-1} + \epsilon_{a,o,d,t} \quad (4.2)$$

where  $L$  is a dummy variable that denotes exposure to compulsory language courses in the official language of country  $d$ . All other variables are as defined before.

Given that only some foreign languages are studied during compulsory education in European schools, the maximum set of foreign languages considered is composed of English, German, French, Spanish, and Italian.<sup>10</sup> While for most countries, second foreign languages are either German or French, for individuals in Portugal, Greece, France, and Italy we also include Spanish and for individuals in Malta, Italian. For each country we specifically include all possible choices of languages. This guarantees that individual choices which are potentially correlated with migration intentions and differences in labor market conditions of origin and destination countries do not alter the estimated effect. For destination countries where neither English, German, French, Spanish, or Italian are official languages, we set  $L_{a,o,d,t} = 0$  for all  $t, a, o$ . For migration between countries that share the same national language, as Germany and Austria, UK and Ireland, France and Belgium, or the Netherlands and Belgium we set  $L_{a,o,d,t} = 1$  for all  $t, a$ . As a result, in our model specification that includes triple interactions some variables  $D_{d,o,t}$  and  $D_{d,a,t}$  are not going to be identified. As discussed before, as long as identifying these dummy variables is not our main interest, this will not pose a problem.

## 5 Results

We first test whether changes in the length of compulsory schooling have any impact on the actual number of years of schooling. To this end we regress years of compulsory schooling as determined by each country’s education policy on actual average years of schooling. We take average years of schooling as measured by Barro and Lee [2010] for different age groups for 2010 and we also include dummies for age, country of origin, and destination and their simple interactions in our regression. Table A.1 of the Appendix shows the results. The estimated coefficients indicate that the analyzed policies were

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<sup>10</sup>Even though Russian is the most widely taught second foreign language in Latvia, Estonia, and Lithuania we ignore this option given that migration to Russia is restricted, different from migration within the EU.

effective in increasing actual years of schooling for the affected cohorts.<sup>11</sup>

We then turn to our empirical analysis regarding the impact of additional years of compulsory schooling on the propensity to migrate. Results from our first model as defined in Equation 4.1 are displayed in Table 5.2. The first column corresponds to the basic regression that only includes dummy variables for year, age group, and countries of origin and destination, as well as our control variables for unemployment, stock of immigrants and population by age group. In column 2 we add all simple interactions. In column 3 we include a triple interaction (destination by origin by year). Column 4 presents results for the most complete specification which also includes the triple interaction of destination, age, and year dummies. The coefficients are negative, significant, and very stable across specifications. An additional year of compulsory schooling decreases the number of immigrants from the affected cohort by 37 individuals who migrate in a given year to one specific destination country. This implies a reduction of 17% with respect to the mean. If countries increase the length of compulsory education simultaneously, less migration might be due to more education in the origin country as well as more in the destination country. The latter might imply increased competition and lower wages for high-skilled jobs. Hence, we also test for such possible general equilibrium effects by including years of compulsory schooling in the destination country into our regressions. Coefficients for this variables are never significant.

Table 5.3 - similarly structured as Table 5.2- contains the estimation results of our model that considers the effect of compulsory foreign language courses on migration. In particular, we consider how having been exposed to English, French, and German during compulsory education raises the odds of migrating to the UK, Ireland, Belgium, Germany, or Austria. For individuals in Portugal, Greece, France, and Italy we also consider if having been exposed to Spanish increases the odds of migrating to Spain. Finally, for individuals in Malta we consider if having been exposed to Italian increases the odds of migrating to Italy. Our results show that this is clearly the case. Once we control for simple interactions of destination country, country of origin, age group, and year effects, the coefficient of interest remains stable even after controlling for some second order interactions. We find that speaking the language of a host country more than doubles migration to that country. Exposure to language learning during compulsory education increases the number of individuals of a cohort that migrate to the country where the language is spoken by 320 individuals per year, an increase of 145% with respect to the mean.

However, there might be some concern that educational reforms could be endogenous to

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<sup>11</sup>Barro and Lee [2010] do not provide data for Liechtenstein.

Table 5.2: Migration and length of compulsory schooling

	(1)	(2)	(3)	(4)
Years of compulsory school	-34.725 (14.804)**	-35.464 (13.275)***	-37.258 (14.336)***	-36.887 (14.307)***
No. of observations	11205	11205	11205	11205
$R^2$	0.684	0.713	0.929	0.931
All simple interactions		X	X	X
Destination by origin by year			X	X
Destination by age by year				X

The dependent variable is the number of immigrants. The variable years of compulsory schooling refers to the average number of years of compulsory schooling faced by the corresponding cohort. The coefficients are marked with \* if the level of significance is between 5% and 10%, \*\* if the level of significance is between 1% and 5% and \*\*\* if the level of significance is less than 1%. All regressions contain year-fixed effects, age indicators, binary variables for each pair of origin and destination countries, dummies for each combination of age and year, a variable for differences in lagged unemployment rate between origin and destination countries, the stock of co-nationals from each cohort in the destination country in the previous period, size of the age cohort in the origin country and a variable for the number of years lived under a communist regime. Errors are clustered by origin-destination-age.

migration if differences in unemployment rates between origin and destination countries jointly determined reforms and migration patterns. If governments considered it their duty to improve their citizens' prospects as migrants they could decide to increase years of compulsory schooling or compulsory foreign language courses. For instance if the recent increase in migration by Portuguese, Spanish, and Greek citizens to Germany would lead these governments to strengthen teaching of German at compulsory levels, in the future we could observe an increase in migration that would have ultimately been caused by differences in unemployment rates rather than by improved language skills. However, from time passed the moment that education reforms are implemented to the time that students finish their compulsory education and enter the labor market - be it at home or abroad - is likely to exceed governments' mandates. The only example known to us of a government explicitly providing training such that its citizens become migrant workers is the training of nurses in the Philippines, see Lorenzo et al [2007]. However, such a training of adult workers is likely to have an immediate effect on domestic unemployment rates.

For the case of a nation-wide education reform that was implemented sequentially by Norwegian municipalities, both Machin, Salvanes and Pelkonen [2012] and Black, Devereux and Salvanes [2005] provide a similar test for the exogeneity of this timing. They suggest running a regression of birth year of affected cohorts on a variety of socio-economic vari-

Table 5.3: Migration and compulsory foreign languages course

	(1)	(2)	(3)	(4)
Foreign language courses	552.467 (205.545)***	303.918 (185.614)	314.665 (187.293)*	319.577 (190.586)*
No. of observations	11205	11205	11205	11205
$R^2$	0.685	0.725	0.928	0.93
All simple interactions		X	X	X
Destination by origin by year			X	X
Destination by age by year				X

The dependent variable is the number of immigrants, the variable foreign language courses identifies the cohorts from the country of origin who were exposed to learning the language of the country of destination during compulsory schooling. The coefficients are marked with \* if the level of significance is between 5% and 10%, \*\* if the level of significance is between 1% and 5% and \*\*\* if the level of significance is less than 1%. All regressions contain year-fixed effects, age indicators, binary variables for each pair of origin and destination countries, dummies for each combination of age and year, a variable for differences in lagged unemployment rate between origin and destination countries, the stock of co-nationals from each cohort in the destination country in the previous period, size of the age cohort and a variable for the number of years lived under a communist regime. Errors are clustered by origin-destination-age.

ables(income, labor force participation, educational attainment, election outcomes etc.) measured around the time of the reform. The authors of both papers conclude that county fixed effects turn out to be the only significant variables in these regressions. As those same fixed effects are included in their main regressions, this dependence does not pose any problem. In our case, main regressions include country fixed effects and if the timing of reforms across countries is mainly explained for by these effects we can dismiss any endogeneity concerns. To dismiss any concern that might be left, ideally we would want to replicate the above mentioned strategy for our case. However, lack of data especially for the group of ex-communist countries... Placebo.....

Nevertheless, we check unemployment differentials between potential countries of destination at the time of education reforms in countries of origin. The OECD provides series for unemployment rates from 1956 onwards. Table A.2 of the Appendix displays average differences in unemployment rate five years prior to reforms and ten years before and after the reform in countries that implemented reforms in foreign language teaching and countries where these languages are spoken. Negative differences indicate that unemployment in the country carrying out the educational reform was lower than in the country where the foreign language is spoken. In these cases we can disregard any concern that reforms were driven by governments' desire to encourage migration to these countries. Overall, we do not observe any clear relationship between educational reforms and unemployment

rates. Governments' educational reforms regarding foreign languages in compulsory education do not seem to react to unemployment differentials. On the contrary, most reforms seem to take place in periods of low relative unemployment. This is not surprising as increasing the length of compulsory education and introducing or strengthening teaching of foreign languages requires increased government spending. Hence such policies are much more likely to happen in times of budget surpluses than in situations of economic crisis and fiscal austerity. As part of an expansionary fiscal policy (hiring teachers, etc.) such policies are aimed at improving a country's economic situation, which would discourage outmigration. Spending on education is likely to increase with sound public finances rather than with migration outflows.

Since, the seminal paper by Angrist and Krueger [1991], minimum school leaving age laws have been employed as exogenous shifters of educational attainment in studies of the causal relationship between education and many different outcomes. Some of these outcomes include earnings (Harmon and Walker [1995]), fertility (Lavy and Zablotsky [2011]), health (Brunello, Fabbri and Fort [2013]) and citizenship (Milligan, Moretti and Oreopoulos [2004]). More relevant to us and as discussed before, changes in the minimum school leaving age have also been used in analyses of the impact of education on internal migration in Norway (Machin, Salvanes and Pelkonen [2012]) and the USA (McHenry [2012]). Studies about motivations behind schooling reforms indicate that educational policies do not adhere to labor market, health, or migration considerations, nor to long-term objectives for these or other non-education related variables, see Cuban [1990]. Early studies by Chiswick [1972] and West [1967] support the view that governments are generally willing to increase the age up to which school attendance is compulsory. Hence, the actual implementation of education policies, such as the ones considered here, seem to depend much more on the availability of resources than on the specific ideology of politicians.

## 6 Conclusion

Findings from theoretical and empirical literature have highlighted the role of education for explaining heterogeneity in migration decisions. Changes in the length of compulsory education induce exogenous and significant shifts in the level of educational attainment. Previous literature has used such changes to test whether more education is associated with more or less internal mobility. Results have been mixed. We apply this technique to Europe, an international context with basically unrestricted migration. We show that increases in the length of compulsory education reduce the propensity to migrate across EU countries. One additional year of compulsory education reduces migration by 17%.

We further investigate possible interactions between compulsory education policies and migration and show that the introduction of foreign languages in compulsory school curricula shapes migration patterns. In particular, we find that acquiring foreign language proficiency during compulsory education more than doubles the likelihood to migrate to the country where the language is spoken.

One of the top priorities of the European Union (EU)'s 2020 agenda is to improve educational outcomes. Education policies that lead to a more educated and better prepared workforce are seen as essential for future growth and job creation. Our results suggest that education policies aimed at increasing educational attainment and foreign language proficiency may have contradicting effects on migration.<sup>12</sup> Foreign language proficiency, key for human capital transferability across countries is ranked a chief concern in the Barcelona objective of 2002. The EU Commission has proclaimed the ambitious goal of enabling all EU citizens to communicate in 2 languages other than their mother tongue. Our results suggest that education policies aimed at increasing educational attainment and foreign language proficiency may have contradicting effects on migration. Because by changing the length and the curricula of compulsory schooling, governments not only determine their citizens' educational attainments and their foreign language proficiency but ultimately also influence their migration decisions. Our results suggest that increasing educational attainment while achieving economic convergence within Europe requires coordinated education and labor market policies that together foster mobility. Two examples of such policies are the Bologna process that makes university degrees more comparable across European countries and the Erasmus initiative that provides funding for university exchange programs across Europe. Both of those programs can lower the cost of degree recognition and the latter can also help to improve Europeans' foreign language skills.

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<sup>12</sup>Boldrin and Canova [?] argue that EU policies aimed at achieving convergence in economic conditions across Europe seem to discourage migration at the same time.



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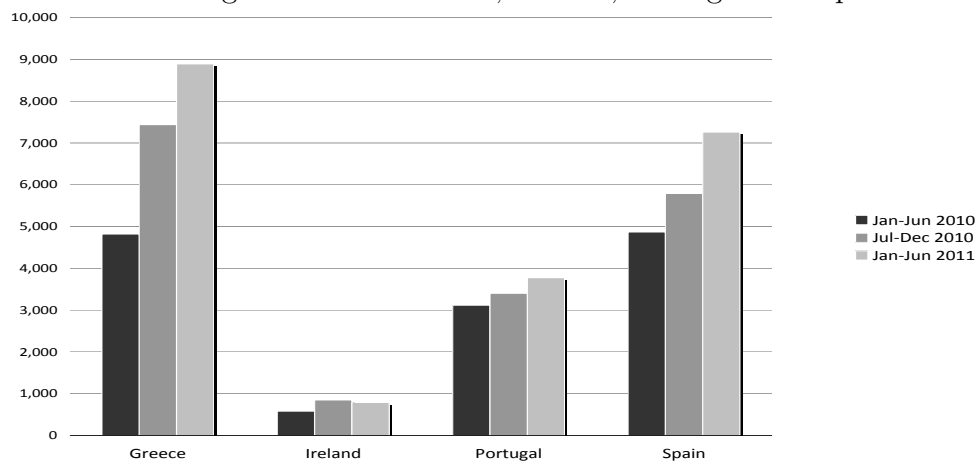
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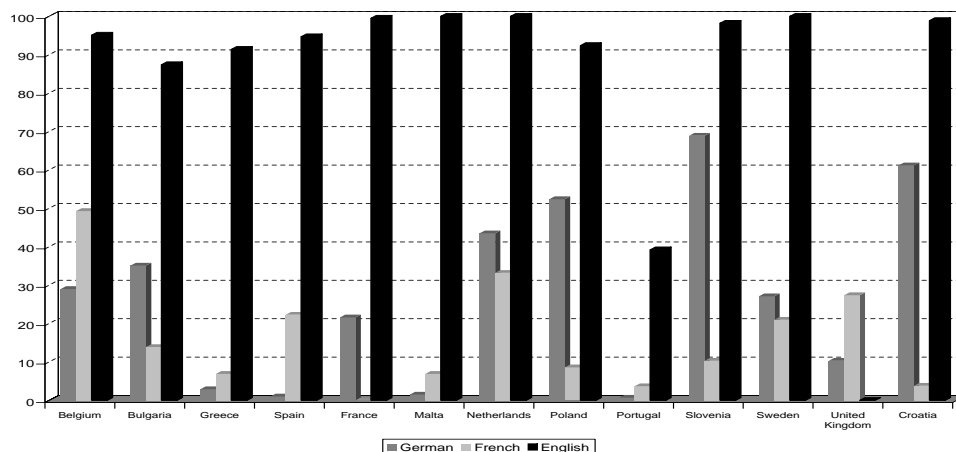
## A Appendix

Figure A-1: Recent migration from Greece, Ireland, Portugal and Spain to Germany



Data: OECD

Figure A-2: Percentage of Students learning foreign languages in selected EU countries



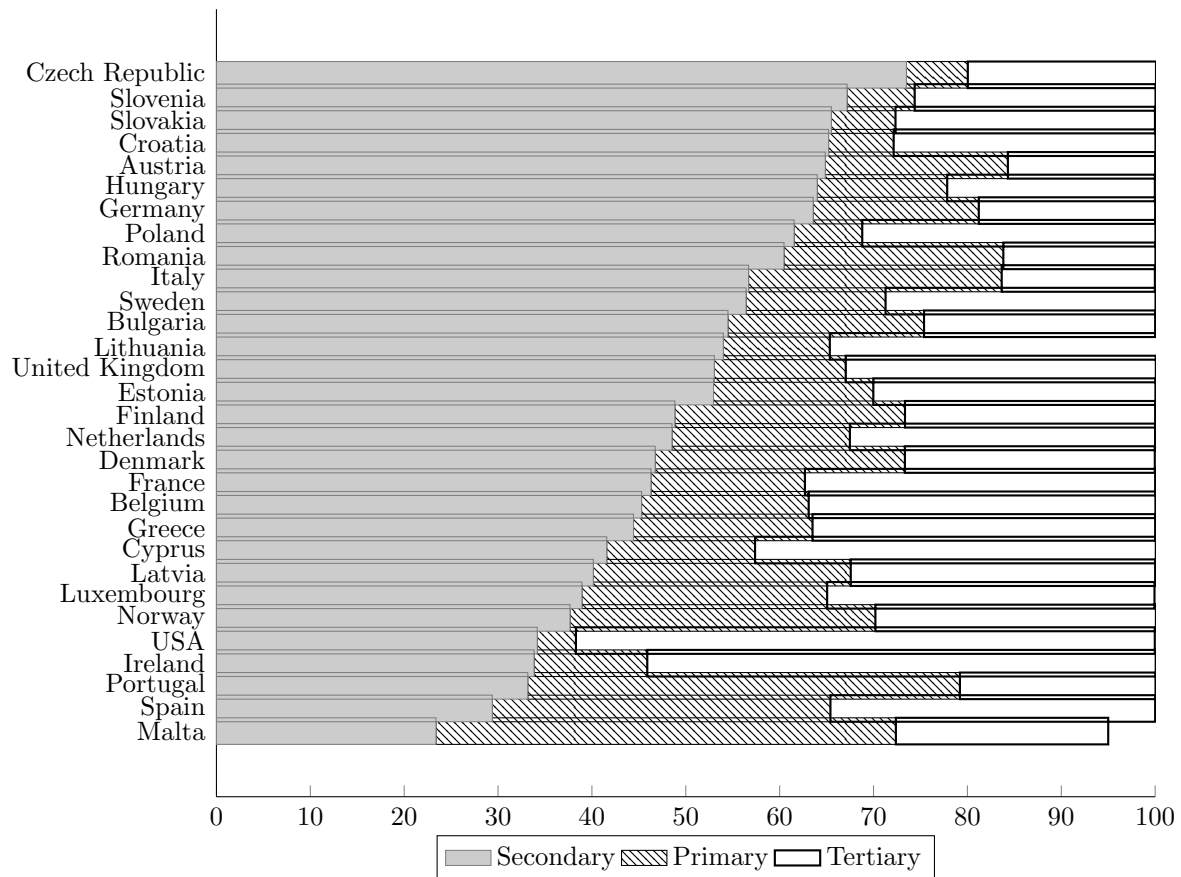
Data: Eurostat

Table A.1: Average years of education and length of compulsory education

	(1)	(2)	(3)
Years of compulsory school	0.158 (0.019)***	0.159 (0.022)***	0.159 (0.022)***
No. of observations	3136	3136	3136
$R^2$	0.732	0.733	0.734
Destination by origin		X	X
Destination by age			X

The dependent variable is the average number of years of education by cohort. The variable years of compulsory schooling refers to the average number of years of compulsory schooling faced by the corresponding cohort. The coefficients are marked with \* if the level of significance is between 5% and 10%, \*\* if the level of significance is between 1% and 5% and \*\*\* if the level of significance is less than 1%. All regressions contain year-fixed effects, age indicators, binary variables for each pair of origin and destination countries, dummies for each combination of age and year, a variable for differences in lagged unemployment rate between origin and destination countries and the stock of co-nationals from each cohort in the destination country in the previous period. Errors are clustered by origin-destination-age.

Figure A-3: Educational attainment of the population 20-34, 2010



Source: Barro and Lee [2010] primary: some secondary, primary and no schooling; secondary: secondary: secondary completed; tertiary: higher than secondary completed; Data for Liechtenstein not available



Table A.2: Relationship: Language Learning and Differences in Unemployment Rates

	Belgium	Denmark*	France	Italy	Portugal	Sweden	Greece
Year Reform (t)	1971	1961	1985	1995	1990	1982	1981
Differences U-Rates:							
with Germany $t + 10/t - 10$	1.98	0.93	1.87	2.84	-0.65	-6.03	0.19
with Germany $t - 6/t - 1$	1.32	1.67	1.41	4.18	0.62	-1.40	-1.60
with Austria $t + 10/t - 10$	2.11	0.03	4.63	6.86	2.82	-0.02	2.19
with Austria $t - 6/t - 1$	0.58	0.96	4.17	7.26	3.60	0.31	0.13
with France $t + 10/t - 10$	-	0.73	-	1.56	-2.57	-3.94	-1.47
with France $t - 6/t - 1$	-	3.04	-	1.80	-2.32	-3.14	-2.93
with Belgium $t + 10/t - 10$	-	-0.17	-	0.49	-4.72	-6.03	-3.52
with Belgium $t - 6/t - 1$	-	0.96	-	0.08	-4.17	-5.74	-5.19
with Spain $t + 10/t - 10$	-	-	-8.04	-6.69	-12.24	-	-7.29
with Spain $t - 6/t - 1$	-	-	-8.54	-8.73	-12.91	-	-5.40

Data: OECD; for Denmark average differences in unemployment 5 years before and 10 years after reform; negative differences indicate higher unemployment rates in Germany, Austria, France, Belgium, Spain.