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Education Policies and Migration across European Countries*

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Abstract

Two leading explanations as to why migration across European countries remains relatively limited are: (i) language barriers and (ii) lower educational attainment in Europe compared to the US. Both aspects are malleable via education policies which thus have the potential to affect migration. This paper tests whether and how (i) increasing the length of compulsory schooling and (ii) introducing foreign languages into compulsory school curricula, influence migration of affected cohorts across European countries. We construct a novel data base that includes information on such education reforms for thirty-one countries spanning four decades. Combining this data with information on recent migration flows by cohorts, we find that an additional year of compulsory education reduces the number of migrants from affected cohorts by almost 14%. Increasing the length of compulsory schooling shifts educational attainment for a significant fraction of the population from low towards medium levels. Our findings are thus in line with the fact that in the majority of European countries medium educated individuals display lower emigration rates compared to low educated individuals. Introducing a foreign language into compulsory school curricula on the other hand, almost doubles the number of migrants from affected cohorts who move to the country where the language is spoken, and it increases the overall number of migrants from these cohorts by 23%.

JEL classification: J61, I20, F22

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1 Introduction

More than fifty years after the first European treaty on labor mobility (Treaty of Rome: 1957), large differences in national unemployment rates across Europe continue to exist. In 2014, in Spain and Greece unemployment was 24-26%, while Germany with 5% had one of the lowest unemployment rates (see Table A.1 of the Appendix). In the context of almost unlimited labor mobility in Europe, one would expect individuals to migrate from countries with high to those with low unemployment rates.¹ But annual migration rates across European Union (EU) countries of around 0.3% were eight times lower than state-to-state migration rates in the US (see OECD data for 2010).² In contrast to the US where English is the only official language, the EU consists of 28 countries and has 24 official working languages. Furthermore, these languages differ quite a bit. Linguists identify at least seven different European language families: celtic, italic, germanic, baltic-slavik, greek, uralic, semitic (see Gray and Atkinson [2003] and Harding and Sokal [1988]). Results in Bartz and Fuchs-Schündeln [2012] show that language barriers more than country borders hinder migration across Europe. On the other hand, Machin, Salvanes and Pelkonen [2012] suggest that lower educational attainment in Europe compared to the US might explain the relatively low European mobility.³

Education policies which provide for additional years of schooling and improvements in foreign language proficiency affect educational attainment and can help to overcome language barriers. This suggests that education reforms – in particular for compulsory education which concerns all students – have the potential to affect migration. The current paper tests this hypothesis by asking how across-country-and-time differences in such education policies influence European migration of affected cohorts. In particular, we consider the following two policies that have been put into practice repeatedly by many countries worldwide: (i) increasing the length of compulsory education and (ii) introduc-

¹European Union (EU) law guarantees free labor mobility but countries can impose temporary restrictions for nationals of new member states. Prior to 2014, some EU member states required that Bulgarian and Romanian nationals obtained residence and work permits.

²Differences in US state unemployment rates are much smaller. In 2014, they ranged from 2.8% in North Dakota to 7.8% in Washington D.C, Mississippi, and Nevada (Bureau of Labor Statistics). US state-to-state migration rates are about twice as large as within-country migration rates in most European countries with the exception of Scandinavian countries and Great Britain, see Gáková and Dijkstra [1995] and Molloy, Smith and Wozniak [2011]. As a response to the latest economic crisis, migration across European countries and in particular from Portugal, Italy, and Spain to Germany has increased somewhat (Jauer et al [2014]), but overall labor mobility remains limited, unlikely to significantly reduce differences in unemployment rates of 20 percentage points.

³Alternative explanations for the low European mobility focus on relatively high unemployment benefits (Antolin and Bover [1997]) and stronger employment protection (Belot [2007]) in European countries compared to the US.

ing foreign languages into compulsory school curricula. Our findings show that additional years of compulsory schooling which shift the educational attainment for a significant fraction of the population from low towards medium levels reduce migration of affected cohorts. This is in line with lower cross-country emigration rates of medium educated individuals compared to low educated individuals in the majority of European countries. On the other hand, we find that introducing a foreign language into compulsory school curricula increases migration of affected cohorts, and in particular to the country where the language is spoken.

Figure 1.1 displays emigration rates for 2010 by educational attainment for individuals age 25 and older in thirty-one European countries. With the exception of Denmark, Bulgaria, and the United Kingdom (UK), those with secondary educational attainment display lower emigration rates compared to primary and tertiary educated. Hence, in most European countries, the relationship between education and migration displays a u-shaped pattern. Moreover, in most European countries more than 40% of individuals between the ages of 25 and 44 only completed their secondary education. In the US, the share of individuals who have no further education than a high-school diploma is much lower (32%) (see Figure A-1 of the Appendix). Hence, the low propensity to migrate of secondary educated individuals who make up an important fraction of the active population might explain the relatively low aggregate mobility in Europe.

But why would medium educated individuals be less likely to migrate than low and highly educated individuals? In the next section we present a model that is able to rationalize such a u-shaped relationship between education and migration. In an environment where returns to education are higher in the destination country but where the recognition of educational degrees in foreign countries is costly, only individuals with high enough levels of education pay the degree recognition costs and migrate. If in addition there exists a minimum wage in the destination country that is paid independently of one's education, low educated individuals might migrate without a recognized degree. Under these circumstances low and highly educated, but not medium educated individuals migrate. We then add the aspect of foreign language proficiency to the model. Foreign languages are necessary for transferring abilities across countries, and better language skills reduce the wage penalty for immigrants. We use this model to predict the impact of education policies on migration. In particular, we foresee that when migration rates are u-shaped, an increase in years of compulsory schooling reduces migration. On the other hand, introducing foreign languages into compulsory school curricula and thus improving language skills, leads to more migration.

Figure 1.1: Emigration rates of individuals > 25 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 our empirical analysis we exploit that education laws change over time, and hence in each country different cohorts face different lengths of compulsory schooling as well as distinct policies regarding compulsory foreign language classes. In particular, our empirical strategy compares migration decisions of: (i) different cohorts from the same country who were exposed to different educational policies due to policy changes, (ii) identical cohorts from different countries who were exposed to different educational policies because of differences in legislation in the two countries. In the case of foreign language classes we add an additional dimension, and we also compare different destination countries; i.e. (iii) that the same cohort in the same country was exposed to languages of some destination countries but not others. For our analysis we use Eurostat data on recent migration flows across European countries. To the best of our knowledge this is the only source that provides migration flows disaggregated by cohorts. Using mostly documentation from the European Commission’s Education, Audiovisual and Culture Executive Agency (Eurydice), we create a novel data base on the introduction of foreign language classes into compulsory school curricula in 31 European countries spanning four decades. We rely on a number of different sources to complete our data base with information on changes to the length of compulsory schooling in each country (e.g. Brunello, Fort and Weber [2009], Garrouste [2010], Hörner et al [2007], Murtin and Viarengo [2011]).

Our estimation strategy controls directly and indirectly for a large number of variables that are likely to affect migration. We directly control for the following three variables disaggregated by cohort: differences in unemployment rates between countries of origin and destination, the presence of other immigrants from the same country of origin, and population size. Introducing interaction terms of country of origin, destination, and time into our regressions, we indirectly control for differences between origin and destination countries regarding any other economic variables which are common to all cohorts and which are typically included in gravity models of migration such as GDP, average wages, female labor force participation rates, etc. Our findings show that increasing compulsory schooling by one year reduces the number of migrants from affected cohorts by almost 14%. Introducing a foreign language into compulsory school curricula on the other hand, almost doubles the number of migrants from affected cohorts who move to the country where the language is spoken, and it increases the overall number of migrants from these cohorts by 23%. Our results are robust to a variety of alternative specifications that also control for reforms regarding the length of compulsory schooling in the destination country or that shut down the effect of English as compulsory foreign language. We address concerns regarding the potential endogeneity of education reforms by considering countries' aggregate macroeconomic conditions and migration outflows prior to reforms. For reforms regarding foreign languages we perform a similar robustness check considering bilateral migration flows to countries where the particular language is spoken. We do not find any evidence for a systematic relationship between the timing or content of education reforms and migration outflows or other key macroeconomic variables.

A number of recent studies use changes in education laws and related policies to instrument for education choices when estimating the causal effect of education on within-country migration.⁴ The before-mentioned paper by Machin, Salvanes and Pelkonen [2012] uses a change in compulsory schooling laws in Norway and finds education to increase internal mobility. State autonomy and geographical distance make migration across US states somewhat more similar to our analysis of migration across European countries. Results for the effect of education on state-to-state migration in the US are mixed. Malamud and Wozniak [2010a] use the risk of being drafted for the Vietnam War as an instrument for college-level education and estimate a positive causal effect of education on migration. Results in their working paper version (Malamud and Wozniak [2010b]) show that when instrumenting education by quarter of birth, the estimates turn negative but not

⁴Using data on educational attainment entails problems of reverse causality if individual decisions on education are influenced by their 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.

significant. As the authors suggest, if the effect of education on migration depends on individuals' baseline educational attainments, such contrasting results might arise. Similar to our analysis and findings, McHenry [2013] uses changes to the minimum school leaving age across US states and shows that for lower levels of education, additional attainment has a negative impact on state-to-state 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 immigrants with individuals from the bottom of the skill distribution being more likely to migrate (Fernández-Huertas Moraga [2011]), to positive self-selection (Chiquiar and Hanson [2005]), to a u-shaped relationship (Caponi [2010]).⁵

Regarding international migration and foreign language proficiency, the existing literature mainly focuses on two important aspects: its determinants and its positive consequences for migrants' social and economic outcomes (see e.g. Dustmann and Fabbri [2003], Gonzalez [2005], Hellerstein and Neumark [forthcoming], Trejo [1997], Bleakley and Chin [2010] among others).⁶ 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 Adsera and Pytlikova [2015] who try to explain migration flows to different OECD countries using linguistic distance 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 contrast to most literature that uses changes in education policies as a means to investigate the effect of educational attainment on migration, the current paper directly tries to address the question: "How do changes in education policies affect migration?" While the effects of education policies most likely operate through changes in individuals' educational attainment, our question is different and does not require an IV estimation. Our strategy also allows for education policies to have general equilibrium effects that go beyond their impact on educational attainment. For instance, increasing the length of compulsory schooling requires additional resources, something that is likely to improve

⁵Quinn and Rubb [2005] propose to reconcile these different findings by looking at education-occupation matches. They find that individuals who work in occupations which require less education are more likely to migrate, while the opposite is true for individuals whose levels of education is below the one required for their occupation. Alternatively, McKenzie and Rapoport [2010] find the effect of education on Mexican-US migration to depend on the size of networks, with larger (smaller) networks attracting disproportionately more uneducated (educated) individuals.

⁶Similar to the current paper, Lleras-Muney and Shertzer [2015] consider changes in education policies, among others compulsory schooling laws and the imposition of English as language of instruction. The authors find no effect of these policies on immigrant assimilation in the US between 1910-1930.

labor market opportunities for teachers while possibly leading to reductions in other categories of public expenditure. Both aspects could potentially also affect migration. In order to make sure that we are also capturing a first order effect, we check that education reforms effectively translated into changes in educational attainment. To this end, we regress the length of compulsory schooling during the time a particular cohort was in school on measures of the cohort’s average educational attainment, and as expected we find a robust positive relationship. Unfortunately, lack of cohort data on foreign language proficiency across countries prevents us from carrying out a similar test for the effect of foreign language classes during compulsory schooling on language proficiency. However, the fact that 68% of Europeans obtained their foreign language skills at school (Eurobarometer [2012]) provides us with confidence that also these policies were effective at achieving their means. Hence, while focusing on the impact of education policies on migration, the current paper also sheds light on the more general question of how educational attainment affects migration.

To the best of our knowledge the current paper is the first to analyze how education policies affect international migration in a multi-country setting. This is important because findings regarding the relationship between education policies and internal mobility cannot simply be extrapolated to the context of international migration. Within a country, educational attainment is easily transferable, but education obtained in one country might not be fully recognized in another country (see Chiswick [2008] or Greenwood and McDormell [1991]). To the best of our knowledge we are also the first to study the impact of acquired language proficiency during compulsory education on migration.⁷ The European setting with basically unrestricted mobility is ideal for our analysis because it allows us to isolate the role of education policies. Many other countries tend to place stricter limits on the entry of low educated individuals compared to highly educated individuals, which makes it difficult to disentangle the effects of education policies from those of migration restrictions. Moreover, speaking a foreign language determines the degree to which human capital is transferable across countries, and the large variety of different languages in Europe provide a context where language proficiency is important for migration. The remainder of this paper is organized as follows: Section 2 presents the model, Section 3 describes our data. In Section 4 we present our estimation strategy. Section 5 presents and discusses our results, and Section 6 concludes.

⁷The paper by Rodríguez-Gutiérrez and Canal-Domínguez [2016] considers the effect of foreign language skills on internal migration in Spain and finds that individuals with better language skills search for jobs in wider geographical areas.

2 Model

According to the traditional framework of the Roy model [1951] applied to the context of migration (see Borjas [1987]), individuals decide to migrate upon comparing their expected incomes in origin and destination countries. Differences in returns to education across countries determine whether relatively more low or more highly educated individuals migrate. However, a simple Roy model [1951] with wages that increase monotonously in education and migration costs which are independent of an individual's education cannot generate the observed u-shaped relationship between education and migration displayed in Figure 1.1. 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].⁸ We adapt his model and illustrate how education reforms which increase educational attainment or improve foreign language proficiency can affect migration.

Consider two countries, one rich R and one poorer country P . Expected wages in each country depend on the individuals' level of education (θ) in the following way

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

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

with $r_0 > p_0 > 0$ indicating that the wage level is higher in the rich country. Parameters r_1 and p_1 , assumed to be strictly positive, represent returns to education in the rich and poorer country respectively. Note that these parameters also incorporate aspects that affect differences in the probability of finding a job, e.g differences in unemployment rates. In particular, even if observed returns to education were the same in the two countries, higher unemployment rates in country P would imply lower expected returns to education.

Language proficiency $k \in [0, 1)$ determines how migrants' wages compare to those of natives with the same level of education. For high enough values of k , individuals of any education level θ have higher expected wages in country R than in country P ,

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

We assume education levels (θ) to be distributed log-normally in $\Theta = [\underline{\theta}, \bar{\theta}]$ with cdf $F(\theta)$ and density $f(\theta, \mu, \sigma)$, with mean μ and standard deviation σ . Additional years of compulsory education shift a mass of individuals from low educational attainment towards

⁸Caponi [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.

medium educational attainment. This leads to a new density $f'(\theta, \mu', \sigma')$ with a higher mean ($\mu' > \mu$) and smaller standard deviation ($\sigma' < \sigma$).

However, an education obtained in one country is not automatically recognized elsewhere. In order to have an educational degree officially recognized in a foreign country, individuals have to incur in cost C to pay for official translations and administrative paperwork requested by government agencies, associations, or guilds. Similar costs might also arise due to license requirements for certain professions. Such requirements do not only differ across countries but also across US states (see e.g. Federman, Harrington and Krynski [2006]). Furthermore, professional licenses are more likely to be held by more educated individuals. According to Kleiner and Krueger [2010] a larger share of workers with college degrees hold occupational licenses (44%) compared to workers with high school diplomas (22%) or high school dropouts (12%). Taking into account degree recognition costs, expected net income in the foreign country is hence given by $kW_R(\theta) - C$. If individuals migrate without a recognized degree they can earn a minimum wage that does not depend on their education $k\bar{W}_R$.⁹

Given certain parameter values, the model generates a u-shaped relationship between educational attainment and migration.¹⁰ The upper graph of Figure 2.2 displays a situation in which returns to education in the destination country are higher than in the country of origin, and the minimum wage in the destination country is higher than the wage low educated individuals can earn in the country of origin. Furthermore, if such minimum wage is lower than the wage that medium educated individuals can earn in the country of origin, a u-shaped pattern will arise. Individuals with low educational attainment – with $\theta < \theta_1$ – migrate without having invested in degree recognition, and they expect to earn $k\bar{W}_R$. Individuals with a medium level of education – between θ_1 and θ_2 – do not migrate, and they earn $W_p(\theta)$. Finally, those with higher educational attainments ($\theta > \theta_2$) pay the degree recognition costs and migrate. They expect to earn $kW_R(\theta) - C$.

As mentioned before, an increase in the length of compulsory schooling leads to a new dis-

⁹In the case of an enforceable minimum wage, discrimination by language skills would be impossible. However, as expected wages in this simple model also incorporate aspects like job quality or probability of unemployment which are likely to be affected by language proficiency, there could still be a discount k on minimum wages. 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.

¹⁰Two thresholds arise as long as the minimum value for educational attainment, $\underline{\theta}$ is such that $\underline{\theta} < \frac{k\bar{W}_R - p_0}{p_1}$, and the parameter k is bounded between $\frac{p_1}{r_1} < k < \frac{p_0 + C}{p_1}$.

tribution of education with a higher mean and a lower variance, as displayed in the lower graph of Figure 2.2. In an environment characterized by a u-shaped relationship between migration and education, this leads to an increase in the share of individuals who do not migrate. The difference between the light and dark gray areas indicates the additional mass of individuals who decide to stay as a consequence of the increase in the length of compulsory schooling. Everything else equal, our model predicts that an increase in the length of compulsory schooling reduces the number of individuals who migrate.

On the other hand, as language proficiency increases from k to k' – for instance as a consequence of the introduction of foreign languages into compulsory school curricula – migrants are able to obtain wages which are more similar to those of natives. Figure 2.3 displays what happens as language proficiency increases.¹¹ Expected wages are higher, both for those who migrate without a recognized degree as well as for those who invest in degree recognition. However, in line with findings in literature the functional form for the relationship between wages and education is such that the increase in expected wages and hence the gains from language proficiency are larger for highly educated individuals (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 slope of the expected wage function for recognized degrees ($k'W_R(\theta) - C$) increase as well. As a result fewer individuals decide to stay. An increasing number of low and highly educated migrate. The model thus predicts that an increase in the length of compulsory schooling reduces migration, while the introduction of foreign languages into compulsory school curricula leads to more migration.

In order to fully test the model, we would need to analyze wage profiles in destination and origin countries. However, differences in wage profiles 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 31 European countries for which comparable estimates for migrants' wages profiles are not available. We can thus only test the model's predictions for migration decisions under different educational policies regarding length of compulsory schooling and foreign languages in compulsory school curricula.

¹¹Without loss of generality, parameter values for Figures 2.2 and 2.3 are chosen such that $C = kr_0$.

Figure 2.2: Effect of increase in length of compulsory education on migration.

Figure 2.3: Effect of improvement in language proficiency from k to k' on migration.

3 Data

For our analysis we use Eurostat data on migration by cohorts across European countries. In particular, we consider immigrant flows by 5-year age groups for all combinations of origin and destination countries for 2008-2012. The following 28 destination countries provide this data: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hungary, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Malta, Netherlands, Norway, Poland, Romania, Slovakia, Slovenia, Spain, and Sweden. For Germany and Austria, missing data for 2009-2012 and 2010 respectively is complemented with data from the Statistische Bundesamt and Statistik Austria. Data for the UK come from the International Passenger Survey of the Office for National Statistics (ONS). We thus have information on 29 destination countries and 31 countries of origin - all destination countries plus France and Portugal. We also rely on Eurostat for data on national unemployment rates, the stock of immigrants from each country of origin, and total population. These three variables are also considered disaggregated by 5-year age groups and are measured one year prior to migration flows, i.e. for 2007-2011.¹⁴

We restrict our sample to young individuals between 25 and 44 who are most likely to migrate for work-related reasons. We exclude individuals younger than 25 because for this group it is difficult to disentangle migration from education decisions, in particular in the presence of a large scale EU program – Erasmus – that provides subsidies for studying abroad (for 2007-13 the EU allocated €3.1 billion to this program). Regarding older workers, in more than half of our countries individuals older than 44 (born before 1964), did not study foreign languages during compulsory education.

We construct a database with information on the length of compulsory schooling for each cohort in each country based on four main sources: Brunello, Fort and Weber [2009], Garrouste [2010], Hörner et al [2007], Murtin and Viarengo [2011]. Educational reforms that changed the length of compulsory schooling during the 20th century for different cohorts generate within- and across-country variation. Take as an example four individuals: A , B , C , D . Individuals A and B reside in Finland and were born in 1968 and 1987 respectively, while individuals C and D also born in 1968 and 1987 reside in Denmark. In Finland in 1977, the length of compulsory schooling increased from 6 to 9 years. Given a school-entry age of 7, all individuals age 7 or younger in 1977; i.e. those born in 1970 or afterwards were affected by this reform. Individual B is hence assigned 9 years of

¹⁴Four countries in our sample are or were not members of the EU during 2008-2012: Croatia, Liechtenstein, Macedonia, and Norway. Our results are robust to the exclusion of these countries.

compulsory education, while individual A is assigned 6 years. In Denmark on the other hand, the length of compulsory schooling increased from 7 to 9 years in 1971. Given a school-entry age of 7, all individuals age 7 or younger in 1971; i.e. those born in 1964 or afterwards were affected. All cohorts in our sample were born between 1964 and 1987, and hence all individuals in Denmark are assigned the same length of compulsory schooling of 9 years. Table A.2 of the Appendix displays all effective changes to the length of compulsory education for our cohorts in the respective countries. A detailed description of education reforms that determined the length of compulsory schooling for all cohorts in all countries (including countries where no effective changes occurred), as well as all respective sources can be found in section A.1 of the Appendix.

We also create a novel database on foreign languages in compulsory education using mainly information from the European Commission’s Education, Audiovisual and Culture Executive Agency (Eurydice). For each cohort and country, this database includes information regarding the starting age for studying foreign languages during compulsory education as well as the type of languages studied. For countries, where students can choose among various foreign languages we consider all options to avoid picking up individual choices which can be endogenous to migration decisions. Educational reforms that have occurred during the last decades imply that some cohorts have been exposed to foreign languages during compulsory education while others have not. There are also differences in the type of foreign languages included in school curricula. In most former communist countries of Central and Eastern Europe after 1990, Russian was replaced by English as the first foreign language. Nowadays, the vast majority of students in European countries study English as their first foreign language. In many countries, studying a second foreign language is compulsory during lower secondary education. Traditionally, only German and French were offered as second foreign languages, but recently individuals in most countries can also choose Spanish and in fewer countries Italian.

These differences and changes over time generate variations within- and across-countries of origin and destination in the exposure to foreign languages during compulsory education. As an example take again individuals A and B in Finland and C and D in Denmark, born in 1968 and 1987, respectively. In Finland in 1999 choices for compulsory foreign languages were expanded from English and Swedish only to also include as second languages German, French, Italian, or Spanish taught from age 14 onwards. This reform hence affected individuals age 14 or younger in 1999; i.e. those born in 1985 and afterwards. Individual B is hence defined as treated for the destination countries Austria, Belgium, Germany, Ireland, Italy, Spain, Sweden, and UK while individual A is only defined as treated for destination countries Ireland, Sweden, and UK. In Denmark, studying English became compulsory in 1970 for students age 12. Given that all cohorts in our sample

were born between 1964 and 1987, individuals C and D in Denmark are both defined as treated for the destination countries Ireland and UK. We summarize this information for all countries in Table A.3 of the Appendix, and in section A.1 of the Appendix we describe these reforms in more detail and specify all sources.

There may exist some concern that language skills acquired during compulsory education may be forgotten by the time working age individuals migrate. To the best of our knowledge there does not exist any study that specifically estimates depreciation rates of foreign language skills, but there are quite a few that estimate depreciation rates of general skills. For instance Arrazola and de Hevia [2004] for Spain and Weber [2014] for Switzerland suggest that annual human capital depreciation rates are in the range of 0-6-1.0% and 1-1.5% respectively. These numbers imply that it would take at least 27 years for an individual to forget half their skills. Regarding our sample of individuals age 25 to 44 it is hence impossible for foreign language skills of treated and non-treated individuals to completely converge.

For our pseudo first stage estimation that tests if education reforms were effective at increasing educational attainment, we consider data from Barro and Lee [2010] on average years of education for each cohort in each country for 2010. Unfortunately, we cannot exploit changes over time because this data is only available every five years.¹⁵ For our exogeneity checks regarding reforms that changed the length of compulsory schooling we have data for 23 of the 31 countries in our sample on emigration from various editions of the United Nations Statistical Yearbooks, available for 1950-1995.¹⁶ For the second exogeneity check considering education reforms that introduced foreign languages into compulsory school curricula, we use data on bilateral migration from the World Bank’s Global Bilateral Migration Database available for all 31 countries for 1960-2000 by decade, and we interpolate data for years in between. Finally, in both exogeneity checks we use data from the OECD for GDP per capita, data from Barro and Lee [2010] for educational

¹⁵Barro and Lee [2010] provide data for all countries included in the main estimations, except Liechtenstein.

¹⁶Editions: 1952, 1954, 1957, 1959, 1962, 1966, 1968, 1970, 1977, 1985, 1989, 1996. Data is available for 23 of the 31 countries. For Croatia, Macedonia, and Slovenia we use data for Yugoslavia available between 1956 and 1977. For the Czech Republic and Slovakia, data for Czechoslovakia is used up to 1992. No data on emigration from the USSR is available, and hence we cannot assign data to Estonia, Latvia or Lithuania. Data for Bulgaria, Romania, and Liechtenstein is only sporadically available and numbers for emigration flows from Ireland exceed those of the Irish population and hence we do not include any of these countries. For Spain, Norway, Finland, and the UK data before 1962, before 1960, between 1960-66, and for 1961-63 respectively could not be used because different from data for all other periods it included only intercontinental migration or excluded migration to Scandinavian countries, or only referred to migration to other Commonwealth countries.

attainment, and World Bank data on population growth and the percentage of the population living in rural areas. These last variables are available from 1960 onwards for all countries with the exception of Macedonia.

Table 3.1 provides summary statistics - mean, standard deviation and minimum and maximum values - for our variables. For our main variables we have observations for 12,914 cells defined by the combination of origin, destination, age group, and year.¹⁷ On average 200 individuals in each age group from each country of origin migrate each year to one of the destination countries. However, we observe a lot of variation in these migration flows. For instance, there were 29,250 individuals age 25-29 from Romania migrating to Italy in 2008, while in 2009 there were no individuals age 30-34 who migrated from Malta to Austria. Average years of compulsory schooling are 9 years, ranging from 6 (for older cohorts in most countries) to 13 for younger cohorts in Germany. Around 12% of our observations - cells defined by the combination of origin, destination, age, and year - were exposed to compulsory foreign language classes in the language of destination countries. Observations are distributed homogeneously across age groups. We have slightly more observations for 2008 than for 2009-2012.

Note that different from typical gravity models of migration we do not consider differences in GDP, but differences in unemployment rates and population, measured one year before migration. These variables have the advantage to be available by age group, and hence they allow us to capture that differences in countries' economic attractiveness might vary by cohort. Regarding differences in unemployment rates we observe a maximum difference of 38 percentage points between unemployment rates in Macedonia and Netherlands for individuals age 25-29 in 2008. Regarding population by age group, on average, there are a little over 1.1 million inhabitants per age group in each country of origin, ranging from only 2,224 individuals age 25-29 in 2011 in Liechtenstein, to more than 7 million individuals age 40-44 in Germany in 2008. Also measured one year before migration is the number of immigrants of a certain age group from a certain country of origin. We include this variable to capture network effects that may explain subsequent migration flows. On average destination countries have around 1,623 immigrants from each age group and country of origin; i.e. more than eight times the average annual inflow. However, while in 2009 there were no individuals from Luxembourg residing in Bulgaria, in 2012 there were

¹⁷In total we should have 19,220 observations (31 origin countries*31 destination countries*4 cohorts*5 years). Unfortunately, we were not able to complement the following missing data: destination countries France, Greece, Latvia, Malta and Portugal, data for Belgium 2008-09, Bulgaria 2009-11, Croatia 2009-10, Cyprus 2009-12, Macedonia 2009-10, Poland 2009-12, Slovakia 2012. The remaining missing data refer to single observations, for instance for half of all destination countries migration from Liechtenstein is missing.

Table 3.1: Summary statistics

Variable	Mean	Std. Dev.	Min.	Max.
<i>Main variables</i>				
Imm flow origin-destination by age	199.869	950.833	0	29,250
Years of compulsory education	9.082	1.171	6	13
Exposed to foreign language	0.119	0.319	0	1
Age group 25-29	0.252	0.434	0	1
Age group 30-34	0.251	0.434	0	1
Age group 35-39	0.249	0.433	0	1
Age group 40-44	0.248	0.432	0	1
Year: 2008	0.226	0.418	0	1
Year: 2009	0.179	0.384	0	1
Year: 2010	0.188	0.39	0	1
Year: 2011	0.199	0.399	0	1
Year: 2012	0.208	0.406	0	1
Diff unemp origin-destination by age	0.515	8.063	-38.1	38.1
Stock population in origin by age	1,129,079.287	1,547,116.645	2,224	7,176,550
Stock imm origin-destination by age	1,623.8	9,610.844	0	324,571
<i>Pseudo first stage</i>				
Average years of schooling by cohort, 2010	12.121	1.005	8.556	14.187
<i>Exogeneity checks</i>				
<u>22 countries: 1960-1995</u>				
Reforms: length of compulsory schooling	0.034	0.197	-1	1
Annual emigration	94,799.035	188,370.315	2	1,239,550
Population growth (annual %)	0.442	0.449	-0.89	3.8
Rural population (% of total population)	27.713	11.93	3.22	61.2
Average years of schooling by cohort	7.644	1.769	2.93	11.24
GDP per capita	11,161.801	6,854.842	1,811.85	41,013.57
<u>30 countries: 1960-2000</u>				
Reforms: foreign languages	0.01	0.098	0	1
Annual bilateral emigration	45,432.088	13,0133.435	0	199,9975
Population growth (annual %)	0.393	0.514	-2.57	3.8
Rural population (% of total population)	28.476	11.178	2.87	61.2
Average years of schooling by cohort	8.205	1.755	2.93	12.69
GDP per capita	13,108.661	8,200.494	1,811.85	56,517.77

Differences in unemployment rates and the stock of immigrants refer to years $t - 1$, i.e 2007, 2008, 2009, 2010, 2011. N=12,914; *N=11,927; **N=350; ***N=3...

324,571 immigrants from Poland aged 40-44 living in Germany.

4 Estimation Strategy

Our identification strategy makes use of all three dimensions of variation in the data, comparing individuals across age group, countries of origin, and time. We could have estimated the effects of education policies on migration by only comparing individuals across age, considering different cohorts from the same country who were affected by different

compulsory schooling laws. However, such an estimation is affected by differences in the propensities to migrate by age. Another alternative would have been to compare individuals of the same cohort from different countries of origin. However, nationals of different countries have different propensities to migrate, independently of education policies. A third approach would have consisted in observing individuals of a certain age and country of origin at different points in time, using the fact that they were affected by different compulsory schooling laws. However, we only have data on migration flows for five years, and even if we disposed of additional data, migration patterns change over time. We improve upon these approaches by combining them all. Using fixed effects, this strategy allows us to control for confounding factors that vary with age, time, and country of origin, and all their pairwise combinations and some triple combinations (country of origin, destination, and time, and country of destination, age cohort, and time). Moreover, in our estimation of the impact of compulsory foreign language classes we introduce a fourth dimension, using the fact that our explanatory variable varies by destination country. We hence compare the propensity to migrate to different destination countries, and we attribute the difference in migration flows between the destination country where the taught language is spoken and other countries to the impact of foreign language classes. 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. Regarding our first model, we estimate the effect of years of compulsory education on the number of migrants in a cohort. We assume the following linear form for the relationship between the two variables:

$$\begin{aligned}
M_{a,o,d,t} = & \alpha_0 + \alpha_1 CS_{a,o,t} + \alpha_2 X_{t-1,a} + \alpha_3 D_a + \alpha_4 D_o + \alpha_5 D_d + \alpha_6 D_t + \alpha_7 D_{a,t} + \\
& + \alpha_8 D_{o,d} + \alpha_9 D_{o,a} + \alpha_{10} D_{o,t} + \alpha_{11} D_{a,d} + \alpha_{12} D_{t,d} + \alpha_{13} D_{d,o,t} + \\
& + \alpha_{14} D_{d,a,t} + \epsilon_{a,o,d,t}
\end{aligned} \tag{4.1}$$

where $M_{a,o,d,t}$ is the number of immigrants of age a from country o going to country d in year t . $CS_{a,o,t}$ denotes the number of years of compulsory schooling faced by individuals of age a and country of origin o in year t , and $X_{t-1,a}$ are lagged control variables by age group such as total population in country of origin, stock of immigrants from each country of origin settled in the destination country, and differences in the unemployment rates by age group between the destination country and the country of origin. D_s with $s = a, o, d, t$ are dummies for age, country of origin, country of destination, and year. Our basic model includes all four dummy variables and two interaction terms, one for age group and year ($D_{a,t}$), as well as another one for country of origin and destination, ($D_{o,d}$).

We then expand the model and include all six simple interactions as well as two double interactions of dummy variables. In particular, we add the interaction term $D_{d,o,t}$ between country of origin, country of destination, and year. This term accounts for pull and push factors between country pairs that change over time and that affect individuals regardless of their age. Including these dummy variables is equivalent to including control variables from typical gravity models like differences in GDP, 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]). Including these terms in the estimation is additionally important in our context for two reasons: (i) In 2009 and 2011, work restrictions in some countries for nationals of Central European countries that joined the EU in 2004 and 2007 respectively, were finally lifted. (ii) Four countries in our sample (Croatia, Liechtenstein, Macedonia, Norway) did not belong to the EU during 2008-2012. Norway and Liechtenstein belong to the Schengen area which guarantees free mobility since 2001 and 2011 respectively. Croatia joined the EU in 2014, and Macedonia is an EU candidate country, and since 2009 its residents can travel visa-free to the Schengen area. Note that when they were in place, any of these restrictions applied to individuals of all ages. 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.

For countries where the length of compulsory schooling did not change during the time our cohorts were in school, the variable $CS_{a,o,t}$ is a constant. As a result, the corresponding dummy variable $D_{a,o}$ will not be identified. However, as long as identifying this dummy variable is not the focus of our analysis, this will not pose a problem for our estimation. Following Bertrand, Duflo, and Mullainathan [2004], we cluster standard errors at the destination-origin-age level to allow for serial correlation in migration flows over time.

Our second model estimates the number of migrants as a function of exposure to compulsory foreign language classes in the language of the destination country. We assume the following linear form for the relationship between the two variables:

$$\begin{aligned}
M_{a,o,d,t} = & \beta_0 + \beta_1 L_{a,o,d,t} + \beta_2 X_{t-1,a} + \beta_3 D_a + \beta_4 D_o + \beta_5 D_d + \beta_6 D_t + \beta_7 D_{a,t} + \\
& + \alpha_8 D_{o,d} + \alpha_9 D_{o,a} + \alpha_{10} D_{o,t} + \alpha_{11} D_{a,d} + \alpha_{12} D_{t,d} + \alpha_{13} D_{d,o,t} + \\
& + \alpha_{14} D_{d,a,t} + \epsilon_{a,o,d,t}
\end{aligned} \tag{4.2}$$

where $L_{a,o,d,t}$ is a dummy variable that denotes exposure to compulsory language classes of cohorts a from country o in at least one of the official languages of country d .¹⁸ All

¹⁸Limited reliability of data on years of exposure to foreign language classes is the main reason why

other variables are as defined before.

Only some foreign languages are studied during compulsory education in European schools, and hence the set of foreign languages considered includes English, German, French, Spanish, and Italian, Swedish for Finland and Dutch for Belgium.¹⁹ For destination countries where neither of these languages are official languages, we set $L_{a,o,d,t} = 0$ for all t, a, o . As a result, in our model specification that includes triple interactions, dummy variables $D_{d,o,t}$ or $D_{d,a,t}$ are not going to be identified. As mentioned before, as long as identifying these dummy variables is not our main interest, this will not pose a problem. Again, we cluster standard errors at the destination-origin-age level to allow for serial correlation in migration flows over time.

5 Results

We first test whether changes to the length of compulsory schooling have an impact on actual educational attainment. While one expects this to be the case, reforms might not be enforced or individuals could already be staying in school beyond the minimum years required by law. We hence regress average educational attainment as measured by Barro and Lee [2010] for different age groups on our measure of years of compulsory schooling as determined by each country’s education policy. Although we do not carry out an IV estimation we make this regression as comparable to a first stage estimation as possible. In particular, for each country we expand observations by each possible destination country which allows us to include the exact same controls as in our main regressions: differences in unemployment rates between countries of origin and destination, stock of immigrants by country of origin, and total population, all three variables lagged and by age group. Table A.4 of the Appendix shows the results from this estimation. The estimated coefficients indicate that policies that increased the length of compulsory schooling were effective at increasing average years of education for the affected cohorts. Given that already before the reform some individuals were staying in school beyond the minimum school-leaving age, the increase is less than proportional. In particular, we find that one additional year of compulsory schooling increases average educational attainment of affected cohorts by 0.25 years. Our estimate thus is somewhat higher but close to additional

we do not consider such a refinement of our independent variable. Furthermore, comparability across countries would require adjustments for hours taught per week as well for linguistic distance between language of destination and origin countries.

¹⁹Even though Russian is the most widely taught second foreign language in Latvia, Estonia, and Lithuania, we ignore this option given that we do not have data on migration flows to Russia.

0.2 and 0.23 years estimated by Oreopoulos [2007] for increases in the school-leaving age from 15 to 16 years in the US and Canada respectively. This result hence suggests that part of the effects of compulsory schooling reforms on indirectly related outcomes like migration operates through changes in educational attainment.

We then turn to our main regressions. We first consider the the impact of additional years of compulsory schooling on the propensity to migrate. Results from our first model (Equation 4.1) are displayed in Table 5.1. The first column corresponds to the basic regression that includes dummy variables for year, age group, and countries of origin and destination, two interaction terms for age and year and country of origin and destination, as well as our lagged 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 group, and year. Our coefficient of interest is negative, significant, and very stable across all specifications. One additional year of compulsory schooling reduces the number of immigrants from the affected cohorts who migrate in a given year to one specific destination by 27 individuals. This implies a reduction of 13.47% with respect to the overall mean, and basically the same reduction of 13.45% with respect to a mean considering only countries providing identification, i.e. those that carried out education reforms that affected the cohorts in our sample.

Table 5.2 – similarly structured as Table 5.1 – contains the estimation results of our model that considers the effect of compulsory foreign language classes on migration (Equation 4.2). 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 as compared to the odds of migrating to any other European country. For younger individuals in countries like France, Netherlands, and Portugal for example we also consider if having been exposed to Spanish increases the odds of migrating to Spain. Finally, for individuals in countries like Malta, Slovenia, and Austria we also consider if having been exposed to Italian increases the odds of migrating to Italy. Our results show that this is the case. The coefficient of interest remains stable even after controlling for simple interactions of country of destination, country of origin, age group, and year as well as some second order interactions. We find that exposure to foreign language classes during compulsory education almost doubles migration to the country where the language is spoken. The number of individuals of a cohort that migrate to this country increases by 388 individuals per year, 194.18% with respect to the overall mean, and 161.08% with respect to a mean considering only countries providing identification.

Table 5.1: Migration and years of compulsory schooling

	(1)	(2)	(3)	(4)
Years of compulsory schooling	-22.887 (13.840)*	-29.146 (13.728)**	-28.579 (12.638)**	-26.921 (12.777)**
Destination $\times$ year		x	x	x
Destination $\times$ age		x	x	x
Origin $\times$ year			x	x
Destination $\times$ origin $\times$ year			x	x
Destination $\times$ age $\times$ year				x
Obs.	12,914	12,914	12,914	12,914
R^2	0.683	0.713	0.928	0.93

The dependent variable is the number of individuals from a certain age group and country of origin migrating to a certain destination country in one year. The variable years of compulsory schooling refers to the average number of years of compulsory schooling faced by the corresponding cohort in the country of origin. 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 origin and destination countries, dummies for each combination of age and year and each combination of origin and destination countries, a variable for differences in lagged age-specific unemployment rate between origin and destination countries, the stock of co-nationals from each age group in the destination country in the previous period, and the size of the age group in the origin country. Errors are clustered by origin-destination-age.

When comparing the estimate to the previous one for compulsory education, one may wonder how much it represents in terms of overall migration. Note that calculating the overall effect is not a straightforward task because our estimated coefficient could in principle be driven by two aspects: (i) increased migration and (ii) redirected migration towards countries where taught languages are spoken (“substitution effect”).²⁰ One can hence only calculate an upper bound for the overall effect that corresponds to a situation when substitution effects are absent. Considering that only 12% of our observations were exposed to compulsory foreign language classes in the language of destination countries, in absence of substitution effects the total number of emigrants increases by 23%.

²⁰A model as the one in Bertoli, Fernández-Huertas Moraga, and Ortega [2013] where individuals first decide to migrate and then specify their destination country takes into account such substitution effects.

Table 5.2: Migration and compulsory foreign language classes

	(1)	(2)	(3)	(4)
Foreign language classes	552.861 (143.257)***	439.470 (158.142)***	393.405 (151.831)***	388.111 (155.511)**
Destination×year		x	x	x
Destination×age		x	x	x
Origin×year			x	x
Destination×origin×year			x	x
Destination×age×year				x
Obs.	12,914	12,914	12,914	12,914
R^2	0.688	0.727	0.929	0.931

The dependent variable is the number of individuals from a certain age group and country of origin migrating to a certain destination country in one year. The variable foreign language classes 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 origin and destination countries, dummies for each combination of age and year and each combination of origin and destination countries, a variable for differences in lagged age-specific unemployment rate between origin and destination countries, the stock of co-nationals from each age group in the destination country in the previous period, and the size of the age group in the origin country. Errors are clustered by origin-destination-age.

5.1 Endogeneity Concern

There is a long tradition in the literature of using compulsory schooling laws as exogenous shifters of educational attainment. Since the seminal paper by Angrist and Krueger [1991], such laws have been used in studies of the causal relationship between education and many different outcomes, such as earnings (Harmon and Walker [1995], health (Brunello, Fabbri and Fort [2013]), and citizenship (Milligan, Moretti and Oreopoulos [2004]). More relevant to us and as discussed before, changes in the length of compulsory education have also been used in analyses of the impact of education on internal migration in Norway (Machin, Salvanes and Pelkonen [2012]) and the US (Malamud and Wozniak [2010b] and McHenry [2013]). However, there are two reasons that could cause education reforms to be endogenous to migration: (i) reverse causality: if somehow cohort-specific migration patterns in 2008-2012 determined education reforms implemented in the past when those cohorts were in school. (ii) omitted variables: if determinants of cohort-specific migration patterns (e.g differences in cohort-specific labor market conditions between origin

and destination countries) persisted over time, and if they influenced reforms that were implemented when our cohorts were in school.

Regarding reverse causality: Education reforms are predetermined with respect to migration patterns in 2008-2012. Still, migration patterns could be highly persistent over time. However, education reforms could at most be driven by aggregate migration flows, while our approach considers cohort specific migration flows. From a political economy point of view, migration flows are unlikely to influence education policies. Governments design their education policies focusing on the median voter who stays, instead of targeting those who migrate. Moreover, the time that passes from the moment 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. Hence, as governments might not be able to reap the potential fruits in terms of more or less migration, migration flows or brain drain concerns are very unlikely determinants of policies affecting compulsory education.²¹

Regarding omitted variables: To proxy labor market conditions, in our estimations we control for differences in cohort-specific unemployment rates in the year before migration, and our estimated coefficients remain unchanged. This suggests that differences in labor market conditions between origin and destination countries are not driving education reforms implemented in the past. One could think that unemployment rates at the time of the reforms could be a relevant omitted variable, however those are unlikely to affect migration patterns in 2008-2012, in particular once controlling for contemporaneous unemployment. In general, in order to address both concerns, one would like to know more about the determinants of education reforms. To the best of our knowledge there does not exist any established theory on the political economy of education reforms, but increasing the length of compulsory education or introducing foreign language classes into compulsory school curricula requires additional resources: teachers, facilities, etc. The actual implementation of those reforms hence depends on the availability of resources.

However, to dismiss any remaining concerns we carry out a formal exogeneity check. To this end, we define a dependent variable that takes on value one if the length of compulsory schooling increased, zero if it remained unchanged and value minus one if it decreased in a given year and country. To this end we use a broader set of reforms, including those

²¹The only example known to us of a government explicitly providing training such that its citizens become better migrant workers is the training of nurses in the Philippines, see Lorenzo et al [2007]. The effect of such specialized training of adult workers on migration is much more immediate than the one resulting from education reforms regarding compulsory schooling.

that did not introduce any effective change in compulsory schoolings for cohorts in our sample. Table A.5 of the Appendix displays the dependent variable for the countries in a reduced sample.²² We regress this variable on a variety of potentially related variables related to demographics (migration outflow, population growth), urban development (% rural population), education (average years of schooling), and economic development (GDP per capita) in the reform year. We also control for dummy variables for year and country of origin. Column one of Table A.6 in the Appendix shows the results from this estimation. We do not find any systematic relationship between migration outflows or other key macroeconomic variables, their evolution, and the timing and content of reforms regarding the length of compulsory education.

Second, we consider reforms related to the introduction of foreign languages into compulsory school curricula. We define a dependent variable that takes on value one if the language of the destination country is introduced as a foreign language in compulsory school curricula of the origin country in a given year. Again we use a broader set of reforms, including those that did not introduce any effective change to foreign languages studied during compulsory education for cohorts in our sample, see Table A.3. We regress this variable on the same economic variables, but instead of aggregate migration outflows we consider bilateral migration flows to the respective destination country (or countries) where the foreign language is spoken. This data is available for all countries in our sample for 1960-2000. Again we have to exclude Macedonia because data for other regressors is not available. This leaves us with 30 countries for 1960-2000. We also include dummy variables for year, origin, destination, and interaction terms for year and destination as well as origin and destination. Column two of Table A.6 display the results. We estimate two significant relationship between the timing of education reforms regarding foreign languages and population growth and the fraction of the population living in rural areas. For most countries' population growth rates and the fractions of population living in rural areas have declined over time. We conjecture that both relationships might be driven by the fact that countries such as Belgium, Denmark, France, Netherlands Norway and Sweden that introduced reforms early on in the 1960's, were still experiencing higher fertility rates at that point and hence higher population growth, and during these periods they also had larger fractions of the population living in rural areas. We do not find any significant relationship between bilateral migration outflows, any other key macroeconomic variables, and the timing and content of reforms related to the introduction of foreign languages into compulsory school curricula.

²²Note that this reduced sample consists of 22 countries for which we have data for all regressors for 1960-1995. Aggregate migration outflow data are available for 23 countries from 1950-1995, but data for all other control variables is not available for Macedonia and for all other countries only from 1960 onwards.

5.2 Other Robustness Checks

If different countries simultaneously increased the length of compulsory schooling, less migration could be due to more education in the origin country but also due to more education in the destination country. The latter effect might arise if more education leads to increased competition and lower wages for high-skilled jobs, disincentivizing migration. By also including years of compulsory schooling in the destination country into our regressions we test for the presence of such effects. Table A.7 of the Appendix displays the results from this estimation. The coefficient for the variable “years of compulsory schooling in destination” is only significant in our first most simple specification, while the coefficient for “years of compulsory schooling” in the origin country remains basically unaltered.

As mentioned before, young individuals in most European countries study English as their first foreign language during compulsory education. Hence, there might exist some concern that results regarding the effects of language learning on migration could be exclusively driven by migration to the UK and Ireland. However, when excluding observations for these two destination countries, the coefficient for “foreign language classes” remains fairly unaltered, see Table A.8 of the Appendix.

After the end of communism, some countries in Central and Eastern Europe broke apart but they share a common past, including education reforms that occurred before 1990. In order to account for this we cluster standard errors for the following countries; those formerly belonging to the Soviet Union (Estonia, Latvia, Lithuania), to Yugoslavia (Croatia, Macedonia and Slovenia) and Czechoslovakia (Czech Republic and Slovakia). Tables A.9 and A.10 show that results from this estimation are almost indistinguishable from those in our main specification.

As mentioned before, four countries in our sample (Croatia, Liechtenstein, Macedonia, and Norway) did not belong to the EU during 2008-2012, and hence they might have faced or imposed different migration restrictions compared to other countries in our sample. We repeat our estimation excluding these countries from our sample. Tables A.11 and A.12 show that results from both estimations are robust to the exclusion of these countries, and that our coefficients of interest are somewhat larger.

6 Conclusion

Previous literature has used education reforms to test whether more education is associated with more or less within-country mobility. Results have been mixed. We consider an international context with basically unrestricted migration – Europe – and test for the direct effect of education policies on migration. We show that increases in the length of compulsory education reduce the propensity to migrate across European countries. One additional year of compulsory education reduces migration by affected cohorts by almost 14%. We also show that the introduction of foreign languages into compulsory school curricula on the other hand, increases migration. In particular, we find that almost twice as many migrants from cohorts that acquired foreign language skills during compulsory education move to the country where the language is spoken. Depending on the specific content of an education policy, “more education” can thus have opposite effects on migration.

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 essential for future growth and job creation. At the same time, labor mobility is one of the main EU objectives, and foreign language proficiency, key for human capital transferability across countries is ranked a chief concern in the Barcelona objective of 2002. Our results suggest that education policies aimed at increasing educational attainment and foreign language proficiency may have opposite effects on migration. Increasing educational attainment while reducing differentials in national unemployment rates across Europe thus requires coordinated education and labor market policies.²³ For lower levels of education, our results show that governments can be fairly confident that more years of compulsory schooling are unlikely to be lost to brain drain. Our results do not extend to higher levels of education, but within the context of our theoretical model we can conjecture that initiatives like the Bologna process that makes university degrees across Europe comparable can help to reduce degree recognition costs, increase returns to migration and foster mobility. Recently, the EU Commission has proclaimed the ambitious goal of enabling all EU citizens to communicate in two languages other than their mother tongue. If the EU wants to seriously promote a unified labor market, it should strengthen teaching of foreign languages in compulsory education, and in particular of those languages spoken in countries with strong labor markets (German instead of Spanish).

²³Boldrin and Canova [2001] 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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A Appendix

Table A.1: Unemployment rates in European countries, 2014

country	unemployment (%)
Austria	5.6
Belgium	8.5
Bulgaria	11.4
Croatia	17.3
Cyprus	16.1
Czech Republic	6.1
Denmark	6.6
Estonia	7.4
Finland	8.7
France	10.3
Germany	5.0
Greece	26.5
Hungary	7.7
Ireland	11.3
Italy	12.7
Latvia	10.8
Liechtenstein	2.6
Lithuania	10.7
Luxembourg	6.0
Macedonia	27.9
Malta	5.9
Netherlands	7.4
Norway	3.5
Poland	9
Portugal	14.1
Romania	6.8
Slovakia	13.2
Slovenia	9.7
Spain	24.5
Sweden	7.9
United Kingdom	6.1

Sources: Eurostat and for Macedonia and Liechtenstein (2013)World Bank Data

Figure A-1: Educational attainment of the population age 25-44, in 2010

Source: Barro and Lee [2010] primary: some secondary, primary and no schooling; secondary: secondary completed; tertiary: higher than secondary completed;

Table A.2: Reforms: Changes to length of compulsory education

country	reform year	length in years		first affected cohort
		before	after	
Belgium	1983	8	12	1969
Bulgaria	1991	8	9	1976
Czech Republic	1979	9	10	1968
Czech Republic	1990	10	9	1975
Estonia	1980	8	11	1973
Estonia	1992	11	9	1976
Finland	1977	6	9	1970
Germany	1992	9	13	1977
Latvia	1980	8	11	1973
Latvia	1991	11	9	1975
Lithuania	1980	8	11	1973
Lithuania	1991	11	9	1975
Luxembourg	1977	9	10	1972
Malta	1988	10	11	1983
Netherlands	1985	10	11	1973
Netherlands	1985	11	12	1980
Poland	1999	8	9	1986
Portugal	1986	6	9	1980
Romania	1991	10	8	1976
Slovakia	1979	9	10	1968
Slovakia	1990	10	9	1975
Slovakia	1998	9	10	1984
Spain	1990	8	10	1978

Sources: Archimedes Foundation [2010], Brunello, Fort and Weber [2009], European Network of Education Councils [2010], Eurydice [2001b], Eurydice [2009], Eurydice country reports [2001a], Eurydice [2012b], Eurydice [1997], Eurydice Website, Garrouste [2010], Le Gouvernement du Grand-Duché de Luxembourg [2011], Hörner et al [2007], Murtin and Viarengo [2011], National Education Act Bulgaria, OECD [2001], OECD [2002], OECD [2003], Reiff [2012], Saar [2008], Schöpflin [1986], Tomich [1963], Umehara and Popovich [1990], Unesco [2012], Worldbank [1990].

Table A.3: Reforms: Foreign languages in compulsory school curricula

origin country	reform year	destination countries	first affected cohort
Austria	1983	Ireland, UK, Belgium	1975
Austria	1993	Italy	1985
Belgium	1963	Austria, Germany, Netherlands	1955
Belgium	1989	Ireland, UK	1977
Bulgaria	1985	Austria, Belgium, Germany, Ireland, UK	1974
Bulgaria	1993	Italy, Spain	1982
Croatia	1960's	Austria, Germany, Ireland, UK	1950's
Croatia	1981	Italy	1971
Croatia	1985	Belgium	1975
Cyprus	1965	Ireland, UK	1956
Cyprus	1972	Belgium	1958
Czech Republic	1989	Austria, Belgium, Germany, Ireland, Spain, UK	1979
Denmark	1970	Ireland, UK	1958
Estonia	1992	Austria, Belgium, Germany, Ireland, UK	1983
Finland	1977	Ireland, Sweden, UK	1963
Finland	1999	Austria, Belgium, Germany, Italy, Spain	1985
France	1963	Austria, Germany, Ireland, UK	1952
France	1998	Spain	1985
Germany	1964	Ireland, UK	1954
Greece	1976	Belgium, Ireland, UK	1964
Greece	1993	Austria, Germany	1981
Hungary	1989	Austria, Germany, Ireland, UK	1979
Italy	1963	Austria, Belgium, Germany, Ireland, Spain, UK	1952
Latvia	1991	Austria, Belgium, Germany, Ireland, UK	1982
Liechtenstein	1971	Belgium	1960
Liechtenstein	1996	Ireland, UK	1988
Lithuania	1990	Austria, Belgium, Germany, Ireland, UK	1980
Luxembourg	1912	Austria, Germany, Belgium	1904
Luxembourg	1968	UK, Ireland	1955
Macedonia	1960's	Austria, Germany, Ireland, UK	1950's
Macedonia	1981	Italy	1971
Macedonia	1985	Belgium	1975
Malta	1964	Ireland, UK	1959
Malta	2004	Austria, Belgium, Germany, Italy, Spain	1993
Netherlands	1963	Austria, Germany, Belgium, Ireland, United Kingdom	1952
Netherlands	1991	Spain	1980
Netherlands	2000	Italy	1988
Norway	1969	Ireland, UK	1959
Poland	1990	Austria, Belgium, Germany, Ireland, UK	1979
Portugal	1986	Austria, Belgium, Germany, Ireland, UK	1976
Portugal	1997	Spain	1987
Romania	1969	Austria, Belgium, Germany, Ireland, UK	1959
Romania	1990	Italy, Spain	1980
Slovakia	1989	Austria, Belgium, Germany, Ireland, Spain, UK	1979
Slovakia	1993	Italy	1983
Slovenia	1960's	Austria, Germany, Ireland, UK	1950's
Slovenia	1981	Italy	1971
Slovenia	1985	Belgium	1975
Spain	1990	Ireland, UK	1982
Sweden	1962	Ireland, UK	1952
Sweden	1994	Austria, Belgium, Germany, Spain	1982
UK	1988	Austria, Belgium, Germany, Spain	1977

Sources: Braham [1972], Council of Europe [2015], Eurydice country reports [2001a], Eurydice [2009], Eurydice [2012a], Eurydice [2001b], National Center on Education and the Economy [2006], State Statistical Office, Republic of Macedonia [2015], Tomich [1963]

Table A.4: Average educational attainment and length of compulsory schooling

	(1)	(2)	(3)
Years of compulsory schooling	0.298 (0.018)***	0.241 (0.017)***	0.25 (0.019)***
Age group dummies		x	x
Country of origin dummies		x	x
Country of destination dummies		x	x
Destination×origin			x
Destination×age			x
Obs.	3,480	3,480	3,480
R^2	0.117	0.758	0.762
F statistic	48.274	483.324	29.08

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 lagged differences in unemployment rates, immigrant population and population for each age group. Errors are clustered by origin-destination-age.

Table A.5: Exogeneity check: Compulsory schooling reforms

country	reform year	change	country	reform year	change
Austria	1962	1	Malta	1988	1
Belgium	1983	1	Netherlands	1975	1
Cyprus	1972	1	Netherlands	1985	1
Czech Republic	1979	1	Norway	1969	1
Czech Republic	1990	-1	Norway	1997	1
Denmark	1971	1	Poland	1999	1
Finland	1977	1	Portugal	1986	1
France	1967	1	Slovakia	1979	1
Germany	1992	1	Slovakia	1990	-1
Greece	1975	1	Slovakia	1998	1
Italy	1963	1	Spain	1970	1
Luxembourg	1977	1	Spain	1990	1
Luxembourg	1993	1	Sweden	1962	1
Malta	1974	1	UK	1973	1

Table A.6: Exogeneity check: Timing and content of education reforms

	Reforms: Compulsory schooling	Reforms: Foreign languages
	(1)	(2)
Annual migration outflow	-3.71e-08 (1.54e-07)	
Annual bilateral migration outflow		2.75e-09 (4.73e-08)
Population growth (annual%)	0.003 (0.033)	0.016 (0.008)**
Rural population (% of total population)	0.011 (0.008)	0.005 (0.002)**
Average years of schooling by cohort	0.056 (0.041)	0.018 (0.015)
GDP per capita	2.16e-06 (6.53e-06)	-7.48e-07 (1.92e-06)
Obs.	350	5,820
R^2	0.145	0.479
F statistic	0.868	3.743

Columns (1) reports the specification where there is one observation for each country of origin and year and the dependent variable captures compulsory schooling reforms. In particular, it takes on value 1 if there is an expansion of compulsory schooling, -1 if there is a reduction of compulsory and 0 when there is no change. Column (2) corresponds to regressions where there is one observation for each pair of countries (origin and destination) and year, and the dependent variable equals 1 when the language of the destination country is introduced in the school curricula and zero otherwise. The regression for compulsory schooling reforms includes origin and year dummies while the one for language reforms includes origin, destination, year, origin×destination, and year×destination dummies. 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%. Errors are clustered by origin, destination and age.

Table A.7: Migration and years of compulsory schooling also in destination country

	(1)	(2)	(3)	(4)
Years of compulsory schooling	-21.302 (13.944)	-38.393 (13.928)***	-28.621 (12.633)**	-26.921 (12.777)**
Years of compulsory schooling in destination	59.244 (18.161)***	-6.618 (104.793)	-11.191 (22.623)	1,592.995 (2523.478)
Destination×year		x	x	x
Destination×age		x	x	x
Origin×year			x	x
Destination×origin×year			x	x
Destination×age×year				x
Obs.	12,914	12,914	12,914	12,914
R^2	0.684	0.725	0.928	0.93

The dependent variable is the number of individuals from a certain age group and country of origin migrating to a certain destination country in one year. The variable years of compulsory schooling refers to the average number of years of compulsory schooling faced by the corresponding cohort in the country of origin. 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 origin and destination countries, dummies for each combination of age and year and each combination of origin and destination countries, a variable for differences in lagged age-specific unemployment rate between origin and destination countries, the stock of co-nationals from each age group in the destination country in the previous period, and the size of the age group in the origin country. Errors are clustered by origin-destination-age.

Table A.8: Migration and compulsory foreign language classes, excluding destinations United Kingdom and Ireland

	(1)	(2)	(3)	(4)
Foreign language classes	498.418 (163.892)***	462.165 (195.766)**	387.579 (176.334)**	385.936 (179.485)**
Destination×year		x	x	x
Destination×age		x	x	x
Origin×year			x	x
Destination×origin×year			x	x
Destination×age×year				x
Obs.	12,021	12,021	12,021	12,021
R^2	0.707	0.741	0.957	0.958
F statistic	78.083	101.011		

The dependent variable is the number of individuals from a certain age group and country of origin migrating to a certain destination country in one year. The variable foreign language classes 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 origin and destination countries, dummies for each combination of age and year and each combination of origin and destination countries, a variable for differences in lagged age-specific unemployment rate between origin and destination countries, the stock of co-nationals from each age group in the destination country in the previous period, and the size of the age group in the origin country. Errors are clustered by origin-destination-age.

Table A.9: Migration and length of compulsory schooling, clustered standard errors for countries with recent common history

	(1)	(2)	(3)	(4)
Years of compulsory schooling	-22.887 (13.899)*	-29.146 (13.777)**	-28.579 (12.704)**	-26.921 (12.844)**
Destination×year		x	x	x
Destination×age		x	x	x
Origin×year			x	x
Destination×origin×year			x	x
Destination×age×year				x
Obs.	12,914	12,914	12,914	12,914
R^2	0.683	0.713	0.928	0.93

The dependent variable is the number of individuals from a certain age group and country of origin migrating to a certain destination country in one year. The variable years of compulsory schooling refers to the average number of years of compulsory schooling faced by the corresponding cohort in the country of origin. 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 origin and destination countries, dummies for each combination of age and year and each combination of origin and destination countries, a variable for differences in lagged age-specific unemployment rate between origin and destination countries, the stock of co-nationals from each age group in the destination country in the previous period, and the size of the age group in the origin country. Errors are clustered by origin-destination-age taking into account that the following countries have a common history: those formerly belonging to the Soviet Union (Estonia, Latvia, Lithuania), to Yugoslavia (Croatia, Macedonia and Slovenia) and the two countries formerly known as Czechoslovakia (Czech Republic and Slovakia).

Table A.10: Migration and compulsory foreign language classes, clustered standard errors for countries with recent common history

	(1)	(2)	(3)	(4)
Foreign language classes	552.861 (146.759)***	439.470 (160.310)***	393.405 (154.086)**	388.111 (157.852)**
Destination×year		x	x	x
Destination×age		x	x	x
Origin×year			x	x
Destination×origin×year			x	x
Destination×age×year				x
Obs.	12,914	12,914	12,914	12,914
R^2	0.688	0.727	0.929	0.931

The dependent variable is the number of individuals from a certain age group and country of origin migrating to a certain destination country in one year. The variable foreign language classes 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 origin and destination countries, dummies for each combination of age and year and each combination of origin and destination countries, a variable for differences in lagged age-specific unemployment rate between origin and destination countries, the stock of co-nationals from each age group in the destination country in the previous period, and the size of the age group in the origin country. Errors are clustered by origin-destination-age taking into account that the following countries have a common history: those formerly belonging to the Soviet Union (Estonia, Latvia, Lithuania), to Yugoslavia (Croatia, Macedonia and Slovenia) and the two countries formerly known as Czechoslovakia (Czech Republic and Slovakia).

Table A.11: Migration and length of compulsory schooling, excluding non-EU countries

	(1)	(2)	(3)	(4)
Years of compulsory schooling	-31.987 (16.792)*	-37.414 (16.603)**	-35.380 (15.333)**	-33.364 (15.549)**
Destination×year		x	x	x
Destination×age		x	x	x
Origin×year			x	x
Destination×origin×year			x	x
Destination×age×year				x
Obs.	9,641	9,641	9,641	9,641
R^2	0.685	0.714	0.928	0.93

The dependent variable is the number of individuals from a certain age group and country of origin migrating to a certain destination country in one year. The variable years of compulsory schooling refers to the average number of years of compulsory schooling faced by the corresponding cohort in the country of origin. 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 origin and destination countries, dummies for each combination of age and year and each combination of origin and destination countries, a variable for differences in lagged age-specific unemployment rate between origin and destination countries, the stock of co-nationals from each age group in the destination country in the previous period, and the size of the age group in the origin country. Errors are clustered by origin-destination-age. This sample excludes Croatia, Liechtenstein, Macedonia, and Norway.

Table A.12: Migration and compulsory foreign language classes, excluding non-EU countries

	(1)	(2)	(3)	(4)
Foreign language classes	588.572 (151.790)***	474.573 (173.664)***	417.177 (168.916)**	411.956 (173.484)**
Destination×year		x	x	x
Destination×age		x	x	x
Origin×year			x	x
Destination×origin×year			x	x
Destination×age×year				x
Obs.	9,641	9,641	9,641	9,641
R^2	0.69	0.73	0.929	0.932

The dependent variable is the number of individuals from a certain age group and country of origin migrating to a certain destination country in one year. The variable foreign language classes 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 origin and destination countries, dummies for each combination of age and year and each combination of origin and destination countries, a variable for differences in lagged age-specific unemployment rate between origin and destination countries, the stock of co-nationals from each age group in the destination country in the previous period, and the size of the age group in the origin country. Errors are clustered by origin-destination-age. This sample excludes Croatia, Liechtenstein, Macedonia, and Norway.

A.1 Further details on education reforms

In this section we provide further details regarding education reforms that changed the length of compulsory education or that introduced foreign languages into compulsory school curricula and that affected cohorts in our sample; i.e. individuals born between 1964 and 1987. In most cases we only have information on the year the respective education reform was passed.

For reforms regarding the length of compulsory education we apply the following strategy to define the birth year of the first affected cohort: We look at the structure of the education system and ask ourselves which school curricula would have to be adjusted in order to incorporate the reform. Typically school systems consist of either one comprehensive school where students remain during their entire compulsory education, or there are two separate schools for primary and lower secondary education. Some education systems where upper secondary education is compulsory are divided into three modules: primary, lower, and upper secondary school. We assume that education reforms in the presence of the first type of schools can only be implemented for the first entering cohort, i.e. they affect individuals at their school starting age of typically 6 or 7 years. In this case, the birth year of the first affected cohort is calculated as the year of the reform minus the school starting age. In the presence of separate primary and lower secondary schools, we consider that raising the school leaving age requires reforming the curricula of lower secondary schools. Reforms can thus be implemented for the first cohort entering lower secondary education. In this case, the birth year of the first affected cohort is calculated as the year of the reform minus the age of those who have finished primary school and are about to start lower secondary education, typically at the age of 11 or 12. For the last type of schools we assume that reforms to upper secondary education first affect those finishing lower secondary education. In this case, the birth year of the first affected cohort is calculated as reform year minus the age at which individuals typically finish lower secondary education, age 14 or 15.

Regarding the introduction of foreign languages into compulsory school curricula, we consider the year the reform is passed and the age at which students are to start learning the respective foreign language. We then subtract this age from the reform year to obtain the birth year of the first affected cohort. In many countries, students have a choice among a variety of foreign languages. Unless otherwise specified we allow for all possible choices.

Austria: Length of compulsory education: In 1962, education reforms increased the length of compulsory education by one year, from 8 to 9 years; see Brunello, Fort and Weber [2009] or Hörner et al [2007]. From then on individuals had to attend compulsory education from age 6 to age 15. According to Hörner et al [2007] “a compulsory ninth school year was introduced in the form of a polytechnic course” (p. 52). Hence, an additional year was simply added, and the reform did not require any change to existing school curricula. The first affected cohort were individuals turning 14 in 1962, those born in 1948 (see also Brunello, Fort and Weber [2009]). For our sample that includes cohorts born between 1964 and 1987, this implies that there are hence no effective changes to the length of compulsory education.

Compulsory foreign language classes: Austria shares the same official language - German - with Germany and Liechtenstein, and we hence define all individuals from Austria in our sample as knowing the official language of these two countries. According to the Eurydice country report on Austria [2001a], in 1983 learning a foreign language (English or French) became compulsory for students from age 8 onwards, affecting cohorts born in 1975 and later. In 1993, the range of foreign languages was extended to also include Italian. This last reform affected cohorts born in 1985 and later.

Belgium: Length of compulsory education: In 1983, the length of compulsory education was increased by four years, from 8 to 12 years; see Brunello, Fort and Weber [2009] or Hörner et al [2007]. From then on, individuals thus had to attend compulsory education between age 6 and age 18. This reform was implemented by adding a second and third stage to compulsory secondary education which before had consisted of only one stage. These three stages are relatively independent, and hence we assume that students age 14 in 1983 were the first to be affected by the reform, i.e. cohorts born in 1969 and later (see also Brunello, Fort and Weber [2009]).

Compulsory foreign language classes: Belgium consists of three regions and accordingly has three official languages: French, Dutch/Flemish, and German. Since 1963, official languages of the other two regions were studied as foreign languages in school from age 8 onwards (see Eurydice [2001b]). This hence affected those born in 1955 and later. In 1989, English became a second compulsory foreign language in the Flemish part of the country for students at the age of 12, see National Center on Education and the Economy [2006]. In the French part of the country English had already been among the choices for first foreign language. English is not an option for first compulsory foreign language in the German speaking region, see Eurydice [2001b]. However, given that this region is very small, we ignore this difference (76.328 inhabitants compared to a total population of more than 11 million). We define those born in 1977 as the first affected cohort by the introduction of English as compulsory foreign language.

Bulgaria: Length of compulsory education: In 1991, education until age 16 became compulsory (starting at age 7), and hence the length of compulsory schooling increased from 8 to 9 years (see National Education Act Bulgaria). Prior to the reform, compulsory education had consisted of four years of primary and four years of lower secondary education. The reform added one additional year to be completed in vocational training or in upper secondary education, see Hörner et al [2007]. Hence, the curriculum of lower secondary education did not change, and the first affected cohort were individuals age 15 in 1991; those born in 1976. Additional education reforms which made school attendance obligatory for children from age 5 and 6 onwards were passed in 2000 and 2002. However, these reforms are too recent to affect our cohorts (see Hörner et al [2007] and Worldbank [1990]).

Compulsory foreign language classes: In 1985, still under communist regime, while Russian was the first compulsory foreign language, Western languages started being taught as second compulsory foreign languages in fifth grade - at age 11. First only English, German or French could be chosen, but then since 1993 it was also possible to chose Italian or Spanish as first or second compulsory foreign language (see Eurydice country report on Bulgaria [2001a]). The first affected cohorts were hence individuals born in 1974 and 1982 respectively.

Croatia: Note that before 1990, Croatia as well as two other countries in our sample (Macedonia and Slovenia) were part of the country of Yugoslavia.

Length of compulsory education: In 1950, a law was passed extending the length of compulsory schooling from 7 to 8 years. According to Hörner et al [2007], in Croatia this law was enforced in 1952. The reform added one additional year to the comprehensive 7-year school, and individuals had to attend school between age 7 and age 15 (see Schöpflin [1986]). Hence, the first affected cohort were those age 7 in 1952, born in 1945. For our sample that includes cohorts born between 1964 and 1987, this implies that there are hence no effective changes to the length of compulsory education. A recent reform in 2010 that made preschool compulsory for children age 5 and 6 is too recent to affect our cohorts (see OECD [2003]).

Compulsory foreign language classes: In 1958, compulsory foreign languages were introduced into the curriculum of the comprehensive 8 year school in all of Yugoslavia. Students in 5th grade (see Tomich [1963]), at age 10, had to choose English, German, or French (or Russian) (see Eurydice report on Slovenia [2001a]). However, during the 1960's this choice was reduced to English and German (see Eurydice [2001b]). Hence, cohorts born in the 1950's or later were affected by the introduction of English and German. In 1981 and 1985, Italian and French were added to the choice of compulsory foreign languages (see Eurydice report on Slovenia [2001a]), first affecting cohorts born in 1971 and 1975 respectively.

Cyprus: Length of compulsory education: In 1972, secondary education became free and compulsory, see European Network of Education Councils [2010]. This implied an increase in the length of compulsory education by three years, from 6 to 9 years. Secondary school was separate from the six-year primary school, and hence those who had just finished primary school at age 12 in 1972 – born in 1960 – were the first affected cohort. For our sample that includes cohorts born between 1964 and 1987, this implies that there are hence no effective changes to the length of compulsory education. A recent reform in 2004/5 made pre-primary education for children age 5 to 6 compulsory, but is too recent to affect our cohorts (see Hörner et al [2007]).

Compulsory foreign language classes: One of Cyprus’ official languages is Greek and hence we hence define all individuals from Cyprus in our sample as knowing the official language of Greece. According to Eurydice [2001b], since Cyprus gained independence from Great Britain in 1965, English has been taught as a compulsory foreign language to all students at the age of 9. The first affected cohort were hence those born in 1956. According to the same source, studying French was compulsory from age 14 onwards. Given that the school leaving age was raised from 12 to 15 in 1972, learning French hence became compulsory for everybody in 1972. The first affected cohorts were those born in 1958.

Czech Republic: Note that before 1993, the Czech Republic together with Slovakia constituted the country of Czechoslovakia. Hence, reforms prior to 1993 are common for the two countries.

Length of compulsory education: According to Garrouste [2010], education reforms in 1979 increased the length of compulsory education by one year from 9 to 10 years (school attendance: from age 6 to 16). Those ten years were divided into eight comprehensive years (5 plus 3) and 2 additional years. Prior to the reform the structure had been a 9-year (5+4) comprehensive school. Hence, the reform first affected those turning 11 in 1979, i.e. cohorts born in 1968. According to Eurydice [1997] after the fall of the Soviet Union in 1990, compulsory education was shortened back to nine years. According to Hörner et al [2007] the current structure consists of a five year primary school followed by four years of lower secondary education. Hence, the last reform in 1990 first affected individuals of age 15, cohorts born in 1975, who could leave school one year earlier.

Compulsory foreign language classes: According to the Eurydice country report on the Czech Republic [2001a], with the end of communism in 1989 compulsory teaching of Russian was immediately abandoned, and students could choose compulsory foreign languages among English, German, French, Spanish (and also Russian), see Eurydice [2001b]. During the 1990’s compulsory foreign languages were taught to students from age 10 onwards, see Eurydice [2012a]. Hence, the first affected cohort were individuals born in 1979. There is no second compulsory foreign language, see Eurydice [2001b].

Denmark: Length of compulsory education: According to Brunello, Fort and Weber [2009], in 1971 education reforms increased the length of compulsory education by two years from 7 to 9 years (school attendance: from age 7 to 16). In particular, the comprehensive primary school of seven years was expanded, and thus the first affected cohort were individuals turning 7 in 1971, born in 1964 (see Hörner et al [2007] on the single-structure school system). For our sample that includes cohorts born between 1964 and 1987, this implies that there are hence no effective changes to the length of compulsory education. In 2009/10 school attendance became compulsory for children from age 6 onwards, increasing the length of compulsory education to 10 years, see Unesco [2012]. However, this reform is too recent to affect the cohorts in our sample.

Compulsory foreign language classes: According to Eurydice [2001b], since 1958, learning foreign languages has been compulsory. At first students could choose between German and English, but since 1970 English has become the only compulsory foreign language. Initially it was studied from 5th grade onwards. Hence, students age 11 in 1970, those born in 1959, were the first affected cohort. There is no second compulsory foreign language, see Eurydice [2001b].

Estonia: Note that before 1990, Estonia, Latvia, and Lithuania belonged to the Soviet Union. As pointed out in Schöpflin [1986] these Baltic non-Russian regions shared the same education policies, and hence education reforms prior to 1990 are common to these three countries. However, given that in these regions Russian was taught as a foreign language, education policies were not necessarily the same as in the rest of the Soviet Union.

Length of compulsory education: According to Saar [2008], in 1980 the transition to compulsory secondary education was completed. We interpret this such that those starting school in 1980, at age 7, were the first to be affected by the reform; i.e. individuals born in 1973. In 1992, with the end of the Soviet Union and after Estonia regained independence, the length of compulsory education was reduced by 2 years, to 9 years (see the Eurydice country report on Estonia [2001a] or Archimedes Foundation [2010]). This reduction was achieved by eliminating the three additional years of secondary education and extending basic education by one additional year. Hence, the first cohort affected were individuals of age 16 who were finishing basic education in 1992 and could leave school two years earlier, i.e. those born in 1976.

Compulsory foreign language classes: According to the Eurydice country report on Estonia [2001a], in 1992 schools started to offer a choice of compulsory foreign languages: English, German, French, (and Russian). The first compulsory foreign language was studied at the age of 9, and a second compulsory foreign language at the age of 12. Hence, the first cohort affected by this change were those born in 1983.

Finland: Length of compulsory education: According to Brunello, Fort and Weber [2009], during the 1970's the length of compulsory education was extended from 6 to 9 years (school attendance: from age 7 to 16). The last Finish region implemented the reform in 1977, while the first did so in 1972. We use the reform year 1977. According to Hörner et al [2007], the reform above also created a comprehensive school for grades 1-9, and hence the first cohort affected were individuals age 7 in 1977, born in 1970.

Compulsory foreign language classes: According to the Eurydice country report on Finland [2001a], before the extension of compulsory education described above, foreign languages were compulsory only in secondary education which not everybody attended. With the reform in the 1970's, two foreign languages (English and a second domestic one - Swedish (or Finish - for the Swedish minority)) were introduced into the curriculum of the comprehensive school from ages 9 and 14 onwards. Hence using 1977 as the reform year, this affected those born in 1963 and later. Since 1999, schools have been able to also teach German, French, Italian, or Spanish as second compulsory foreign languages. The first cohort affected by this last change were individuals of age 14 in 1999, born in 1985.

France: Length of compulsory education: According to Brunello, Fort and Weber [2009], in 1967 the length of compulsory education was extended by two years from 8 to 10 years (school attendance: from age 6 to 16). According to Garrouste [2010], the structure of the education system since 1963 had been as follows: five years of primary education followed by three years of lower secondary education. The reform in 1967 extended the length of lower secondary education, and hence those finishing primary education at age 11 in 1967, born in 1956 were the first ones affected. For our sample that includes cohorts born between 1964 and 1987, this implies that there are hence no effective changes to the length of compulsory education.

Compulsory foreign language classes: According to Eurydice [2001b], compulsory foreign languages (English or German) had been taught during secondary education since 1880. Hence in 1963, when secondary education was made compulsory for everyone this affected all individuals age 11, those born in 1952 or later. In 1998, a second foreign language became compulsory from age 13 onwards, and students could also choose Spanish which affected those born in 1985 and later.

Germany: Length of compulsory education: According to Garrouste [2010], after the reunification of West and East Germany in 1991/92 education became compulsory for 10 years full time plus 3 years part time. Prior to this reform, in West and East Germany the length of compulsory education had been 9 years (in some states in West Germany 10 years), since 1964 and 1959 respectively. This implies that for many individuals the effective length of compulsory education increased by four years, from nine to thirteen

years, see also Eurydice [2012b]. Given that the three additional years can be completed in vocational training schools which are separated from lower secondary education, this reform affected first those age 15 in 1992 (born in 1977).

Compulsory foreign language classes: Germany shares the same official language - German - with Austria and Liechtenstein, and we hence define all individuals from Germany in our sample as knowing the official language of these two countries. In 1964, English became the first compulsory foreign language taught in all secondary schools to students age 10. Around 10% of students are taught a different first foreign language e.g. French, Russian or Latin, but everybody has to study English at some point during compulsory education see Eurydice [2001b]. Hence, the first affected cohort were individuals age 10 in 1964, born in 1954. Note that a second foreign language while compulsory in some type of secondary schools is not mandatory for all students.

Greece: Length of compulsory education: According to Brunello, Fort and Weber [2009], education reforms in 1975 extended the length of compulsory education from 6 to 9 years (school attendance: age 6 to 15). This implied that after six years of primary school students had to continue for 3 more years in lower secondary education (see Hörner et al [2007] on the structure of the school system). Hence, the reform first affected those age 12 in 1975, born in 1963. For our sample that includes cohorts born between 1964 and 1987, this implies that there are hence no effective changes to the length of compulsory education. In 2007/08 pre-primary education for children age 5 became compulsory, see Unesco [2012]. However, this last reform is too recent to affect our cohorts.

Compulsory foreign language classes: In 1976, learning one compulsory foreign language (English or French) became compulsory for students age 12, in lower secondary education, see the Eurydice country report on Greece [2001a]. Hence, the first affected cohort were individuals age 12 in 1976, born in 1964. According to the same source, since 1993 German has been added to the choices, affecting those born in 1981 and later.

Hungary: Length of compulsory education: According to Umehara and Popovich [1990], in 1948 the length of compulsory education was extended from 6 to 8 years (school attendance: age 6 to 14). Given the structure of the education system which consisted of one comprehensive school, the reform first affected those age 6 in 1948, born in 1942. For our sample that includes cohorts born between 1964 and 1987, this implies that there are hence no effective changes to the length of compulsory education. According to Garrouste [2010], the education reforms passed in 1993 introduced the following changes: i) individuals had to remain in school until age 16 instead of age 14, and thus the length of compulsory education was increased by two years. Given an education system composed of one comprehensive school, this reform first affected those age 6 in 1993, born in 1987.

ii) the school entry age was lowered to age 5, affecting individuals 5 years in 1993, born in 1988; and finally (iii) individuals starting school in 1997/98 had to remain in school until the age of 18; i.e. affecting first those of age 6 in 1998, born in 1992. In 2012, the 18 year compulsory schooling rule was reduced back to 16 years (see Eurydice Website). For our sample that includes cohorts born between 1964 and 1987, none of these aspect of the 1993 reform imply any effective changes to the length of compulsory education.

Compulsory foreign language classes: According to Eurydice [2001b], in 1989 Russian lost its priority status as compulsory foreign language, and students age 10 could also choose Western languages. Hence, the first affected cohort were individuals born in 1979. In principle any foreign language can be studied, but English and German were studied by more than 95% of students in 1999/2000 (see Eurydice Country report on Hungary [2001a]). We hence limit the choice to these two languages.

Ireland: Length of compulsory education: According to Garrouste [2010], in 1972 the school-leaving-age was raised to 15 years. Brunello, Fort and Weber [2009] indicate that this implied an increase in the length of compulsory education by one year. Individuals thus had to attend school from age 6 to 15, for 9 years. According to Hörner et al [2007], the transfer from primary to secondary school takes place at age 12, and hence the first cohort affected by this reform were individuals turning 12 in 1972, those born in 1960. For our sample that includes cohorts born between 1964 and 1987, this implies that there are hence no effective changes to the length of compulsory education. An additional reform in 2000 raised the school-leaving-age to 16, but this reform is too recent to affect our cohorts.

Compulsory foreign language classes: There are no compulsory languages besides Irish and English, see Eurydice [2001b].

Italy: Length of compulsory education: According to Brunello, Fort and Weber [2009], in 1963 the length of compulsory schooling was increased by 3 years, from 5 to 8 years (school attendance: age 6 to 14). According to Hörner et al [2007], the current structure – in place since the 1963 reform – consists of a five year primary school plus three years of lower secondary education. Hence, the reform made lower secondary school compulsory, and thus the first affected by it were individuals age 11 in 1963, born in 1952. For our sample that includes cohorts born between 1964 and 1987, this implies that there are hence no effective changes to the length of compulsory education. Since 2000, schooling is compulsory between the ages of 6 and 15, and hence for 9 years, see Hörner et al [2007]. However, the reform is too recent to affect our cohorts.

Compulsory foreign language classes: According to the Eurydice country report on Italy [2001a], the education reform in 1963 which made lower secondary education obligatory, also intro-

duced compulsory foreign language classes from age 11 onwards. The first affected cohort were individuals age 11 in 1963, those born in 1952. The choice of foreign languages includes English, French, German, or Spanish see Eurydice [2001b].

Latvia: Note that before 1990, Estonia, Latvia, and Lithuania belonged to the Soviet Union. As pointed out in Schöpflin [1986] these Baltic non-Russian regions shared the same education policies, and hence education reforms prior to 1990 are common to these three countries. However, given that in these regions Russian was taught as a foreign language, education policies were not necessarily the same as in the rest of the Soviet Union.

Length of compulsory education: According to Saar [2008], in 1980 the transition to compulsory secondary education was completed. We interpret this such that those starting school in 1980, at age 7, were the first to be affected by the reform; i.e. individuals born in 1973. In 1991, with the end of the Soviet Union and after Latvia regained independence, the length of compulsory education was reduced by 2 years, to 9 years (see Hörner et al [2007] and OECD [2001]). This was achieved by eliminating the three additional years of secondary education and extending basic education by one additional year. Hence, the first cohort affected were individuals of age 16 who were finishing basic education in 1991 and could leave school two years earlier, i.e. those born in 1975. After unsuccessful earlier attempts in 1998 and 1999 (see Hörner et al [2007] and OECD [2001]), in 2002 school attendance was made compulsory from age 5 onwards, see Unesco [2006].

Compulsory foreign language classes: According to Eurydice [2001b], in 1991 Russian lost its priority status as compulsory foreign language, and the first compulsory foreign language (English, French or German) was to be learned from age 9 on (see Eurydice [2012a]). The first cohort affected by this reform were individuals born in 1982.

Liechtenstein: Length of compulsory education: According to Eurydice [2009], in 1971 the education law that is still in effect today was passed, establishing that compulsory education was to last 9 instead of 8 years. The new structure of the school system consisted of five years of primary education and four years of secondary education. The reform thus shortened primary education from 6 to 5 years and compulsory secondary education which previously had lasted for two years was extended to four years. Hence, the first individuals affected were those age 11 in 1971 - born in 1960. They had finished 5 years of primary education and had to stay for two additional years in a reformed secondary school. For our sample that includes cohorts born between 1964 and 1987, this implies that there are hence no effective changes to the length of compulsory education.

Compulsory foreign language classes: Liechtenstein shares the same official language - German - with Germany and Austria, and we hence define all individuals from Liechten-

stein in our sample as knowing the official language of these two countries. In 1971, French was introduced into compulsory school curricula at the beginning of secondary education to be learned from age 11 onwards. This reform thus first affected cohorts born in 1960, see Eurydice [2001b]. English was an option only in some types of secondary schools, but in 1996 English was introduced in curricula of primary education to be learned from age 8 onwards. Hence, all students born in 1988 and later learned English as their first foreign language and French as a second foreign language, see Eurydice [2009]. However, this last reform is too recent to affect the cohorts in our sample.

Lithuania: Note that before 1990, Estonia, Latvia, and Lithuania belonged to the Soviet Union. As pointed out in Schöpflin [1986] these Baltic non-Russian regions shared the same education policies, and hence education reforms prior to 1990 are common to these three countries. However, given that in these regions Russian was taught as a foreign language, education policies were not necessarily the same as in the rest of the Soviet Union.

Length of compulsory education: According to Saar [2008], in 1980 the transition to compulsory secondary education was completed. We interpret this such that those starting school in 1980, at age 7, were the first to be affected by the reform; i.e. individuals born in 1973. In 1991, with the end of the Soviet Union and after Lithuania regained independence, the length of compulsory education was reduced by 2 years, to 9 years (see Hörner et al [2007] and OECD [2002]). This was achieved by eliminating the three additional years of secondary education and extending basic education by one additional year. Hence, the first cohort affected were individuals of age 16 who were finishing basic education in 1991 and could leave school two years earlier, i.e. those born in 1975. According to the OECD [2002], an additional reform was passed in 2000 that increased the length of compulsory education to 10 years. The first affected cohort were individuals turning 6 in 2000, those born in 1994.

Compulsory foreign language classes: According to Eurydice [2001b], in 1990 Russian lost its priority status as compulsory foreign language, and the first compulsory foreign language (English, French or German (or Russian)) was to be learned at age 10 (see Eurydice country report on Lithuania [2001a]). The first cohorts affected by this reform were individuals born in 1980.

Luxembourg: Length of compulsory education: According to Reiff [2012], in 1977 the school-entry-age was lowered from 6 to 5 years, hence first affecting individuals age 5 in 1977, born in 1972. A second reform that also targeted preschool was passed in 1992/93, and lowered the compulsory school-entry-age to 4 years, first affecting individuals born in 1988. These reforms extended the length of compulsory education from 9 to 10 to 11

years. For our sample that includes cohorts born between 1964 and 1987, only the first of the two reforms has an effect on the length of compulsory education. In 2009, a reform was passed that raised the school-leaving-age to 16, increasing the length of compulsory education to 12 years, see Le Gouvernement du Grand-Duché de Luxembourg [2011]. This reform is also too recent to affect any of the cohorts in our sample.

Compulsory foreign language classes: Official languages are Luxembourgish, French, and German. According to Eurydice [2001b], since 1912 all students have to learn German and French from the second year of primary school, age 7 onwards. Since 1968, English has also become compulsory for all students in the 2nd or 3rd grade of secondary education, at age 13 or 14. The first cohorts affected by the first reform were individuals born in 1904, while the latter reform first affected individuals born in 1955.

Macedonia: Note that before 1990, Macedonia, as well as two other countries in our sample (Croatia and Slovenia) were part of the country of Yugoslavia.

Length of compulsory education: In 1950, a law was passed extending the length of compulsory schooling from 7 to 8 years. However, in the whole of Yugoslavia it took until the late 1950's for this law to be enforced, see Tomich [1963]. The reform added one additional year to the comprehensive 7-year school, and individuals thus had to start attending school between age 7 and age 15 (see Schöpflin [1986]). Hence, the first affected cohort were those age 7 in late 1950's, born around 1950. For our sample that includes cohorts born between 1964 and 1987, this implies that there are hence no changes to the length of compulsory education. A recent reform in 2005/6 (see Hörner et al [2007]) made compulsory education obligatory from age 6 onwards, increasing the length of compulsory education to 9 years. However, this reform is too recent to affect our cohorts.

Compulsory foreign language classes: In 1958, compulsory foreign languages were introduced into the curriculum of the comprehensive 8 year school in all of Yugoslavia. Students in 5th grade (see Tomich [1963]), at age 10, had to choose English, German, or French (or Russian) (see Eurydice report on Slovenia [2001a]). However, during the 1960's this choice was reduced to English and German (see Eurydice [2001b]). Hence, cohorts born in the 1950's or later were affected by the introduction of English and German. In 1981 and 1985, Italian and French were added to the choice of compulsory foreign languages (see Eurydice report on Slovenia [2001a]), first affecting cohorts born in 1971 and 1975 respectively; also see State Statistical Office, Republic of Macedonia [2015] indicating the current teaching of foreign languages: English, French, German, Russian, and Italian.

Malta: Length of compulsory education: According to Hörner et al [2007], in 1974 the school-leaving-age was raised to 16 years, leading to an increase in the length of compulsory education from 8 to 10 years. The structure of the education system consisted of a

primary school that lasted for 6 years plus two and later four years of secondary school. Hence, the reform first affected those starting their secondary compulsory education in 1974 at age 12, those born in 1962. For our sample that includes cohorts born between 1964 and 1987, this implies that there are hence no effective changes to the length of compulsory education. According to the same source, the next reform occurred in 1988, and it increased the length of compulsory education from 10 to 11 years by lowering the school entry age to 5 years, first affecting individuals age 5 in 1988, born in 1983.

Compulsory foreign language classes: According to a report by the Council of Europe [2015], since independence from Great Britain in 1964, English lost its status as official language. Since then, English is studied as a compulsory foreign language from age five onwards. This first affected individuals age 5 in 1964, born in 1959. Since 2004, at age 11 all students must also choose a second foreign language: Italian, German, French, Spanish (Arabic or Russian) – before this requirement only applied to students in some but not all secondary schools, see Eurydice [2012a]. This second reform that first affected individuals age 11 in 2004, born in 1993 is too recent to impact the cohorts in our sample.

Netherlands: Length of compulsory education: According to Murtin and Viarengo [2011], the length of compulsory education was raised twice, in 1975 and in 1985 (reform of 1981, implemented in 1985). The structure of the education system since 1968 consisted of a primary school of 6 years plus three years of secondary education, see Garrouste [2010]. The reform in 1975, increased the length of compulsory education from 9 to 10 years, and students had to stay in school until age 16. Due to the reform, those who had finished primary school in 1975, at age 12, had to attend secondary school for an additional year. The first affected cohort were hence individuals born in 1963. For our sample that includes cohorts born between 1964 and 1987, this implies that the 1975 reform does not imply any effective changes to the length of compulsory education. The second reform in 1985 first affected individuals age 12 in 1985, born in 1973. Additionally, the 1985 reform also lowered the compulsory school-entry-age to 5 years, effectively increasing the length of compulsory education to 12 years. This later part of the reform first affected individuals age 5 in 1985, born in 1980, see Garrouste [2010].

Compulsory foreign language classes: According to Eurydice [2001b], in 1963 learning two foreign languages became compulsory for all students in the first year of secondary education, from age 11 onward, affecting cohorts born in 1952 and later. Students could choose between French, English, and German. According to the same source, in 1991, the choice was extended to also include Spanish, affecting those born in 1980 and later. Since, 1999/2000 Italian has also been added. But this reform is too recent to affect cohorts in our sample.

Norway: Length of compulsory education: According to Murtin and Viarengo [2011], the length of compulsory education was raised twice, in 1969 and in 1997. The structure of the education system consisted of one comprehensive school lasting for seven years, see Hörner et al [2007]. The first reform extended its length to 9 years, and it hence first affected individual at the school-entry age of 7 in 1969, born in 1962. The 1997 reform further extended the length of compulsory education to 10 years, but it did so by lowering the school-entry-age to 6 years. The first affected cohort of this last reform were individuals turning 6 in 1997, born in 1991. For our sample that includes cohorts born between 1964 and 1987, this implies that there are hence no effective changes to the length of compulsory education.

Compulsory foreign language classes: According to the Eurydice country report on Norway [2001a], English became compulsory in 1969 for all students from 4th grade onwards. This reforms hence first affected individuals age 10 in 1969, born in 1959. There is no compulsory second foreign language, see Eurydice [2001b].

Poland: Length of compulsory education: According to Hörner et al [2007], in 1999 the duration of compulsory education – unchanged since 1961 – was increased by one year. Instead of a 8-year comprehensive school (see Umehara and Popovich [1990]), the structure of the education system changed to 6 years of primary school plus 3 years of lower secondary school. The school-leaving-age was raised to 16 years while the school-entry-age remained at 7. The reform first affected individuals in 1999 who were starting lower secondary education at age 13, born in 1986. Since 2004/05 per-primary education for 6 year olds has become compulsory (see Unesco [2012]). This increased the length of compulsory education to 10 years, and first affected individuals born in 1998/1999.

Compulsory foreign language classes: According to the Eurydice country report on Poland [2001a], in 1990 Russian lost its priority status as compulsory foreign language, and since then students age 11 have had the choice between English, French or German (or Russian). The reform hence affected those born in 1979 or later. There is no compulsory second foreign language, see Eurydice [2001b].

Portugal: Length of compulsory education: In 1986, nine years of compulsory education were established (see Hörner et al [2007]). This implied an increase of three years with respect to the six years compulsory education that had been in place since 1964 for girls and since 1960 for boys, see Garrouste [2010]. The reform added an additional three-year cycle to the other two already existing 3-year cycles that compose an integrated single structure system (see Eurydice [2001b] and Eurydice Website). Hence, individuals age 6 in 1986, those born in 1980 were the first to be affected. A new law, in place since 2010/11 (see Eurydice [2012b] and Hörner et al [2007]) raised the school-leaving age to

18 and thus extended the length of compulsory education to 12 years. Given that these three additional years of secondary education are independent from the nine-year basic education, the first affected cohort were individuals age 15 in 2010, born in 1995.

Compulsory foreign language classes: With the education reform of 1986 described above, a common basic education also established one compulsory foreign language for all students in the second cycle, from age 10 onwards, see the Eurydice country report on Portugal [2001a]. This first affected those born in 1976. The choice of languages included French, English, or German. Since 1997/98 Spanish was added, hence affecting cohorts born in 1987 and later. According to Eurydice [2001b] a second foreign languages became compulsory in 2002.

Romania: Length of compulsory education: According to Hörner et al [2007], in 1978, the length of compulsory education was extended from 8 to 10 years (school attendance: age 6 to 16), see Umehara and Popovich [1990]). The reform made it obligatory to attend an upper secondary school of two years after 4 years in primary school and 4 years in gymnasium. Hence, the reform first affected those age 14 in 1978, born in 1964. For our sample that includes cohorts born between 1964 and 1987, this implies that there are hence no effective changes to the length of compulsory education. According to Hörner et al [2007], in 1990/91 the length of compulsory education was reduced from 10 to 8 years, and the school-entry-age became 7 years. Individuals age 15 in 1990/91, born in 1976, were the first to be affected, given that they did not have to continue to upper secondary school. According to the same source, in 2003, the length of the lower secondary school was extended by one year. Hence those entering lower secondary school at age 11 (7+4) in 2003, born in 1992, were the first cohort affected. In addition, the same reform also lowered the school-entry-age to 6 years, and the overall length of compulsory education was set back to ten years. This part of the reform first affected individuals of age 6 in 2003, born in 1997. None of these more recent reforms affects cohorts in our sample.

Compulsory foreign language classes: According to Eurydice [2001b], Russian lost its priority status as foreign language already in 1965, and students could choose among (Russian), French, English, German, Spanish, or Italian from grade 5 onward; i.e. at the age of 10. However, Braham [1972] reports that in 1969/70 this choice was effectively limited to (Russian), French, English, or German. Hence, the reform affected cohorts born in 1959 and later. Eurydice [2001b] reports that in 1990, compulsory foreign languages were strengthened, and that in 1998/99 students could also choose Spanish and Italian. We hence interpret that these additional two languages became available after the end of the communist era in 1990, i.e. for those born in 1980 and later.

Slovakia: Note that before 1993, Slovakia together with the Czech Republic constituted the country of Czechoslovakia. Hence, reforms prior to 1993 are common for the two countries.

Length of compulsory education: According to Garrouste [2010], education reforms in 1979 increased the length of compulsory education by one year from 9 to 10 years (school attendance: from age 6 to 16). Those ten years were divided into eight comprehensive years (5 plus 3) and 2 additional years. Prior to the reform the structure had been a 9-year (5+4) comprehensive school. Hence, the reform first affected those turning 11 in 1979, i.e. cohorts born in 1968. According to Eurydice [1997] after the fall of the Soviet Union in 1990, compulsory education was shortened back to nine years. According to Hörner et al [2007] the current structure consists of a five year primary school followed by four years of lower secondary education. Hence, the last reform in 1990 first affected individuals of age 15, cohorts born in 1975, who could leave school one year earlier. Additionally, in 1998 ten years of compulsory schooling were passed (see Unesco [2012] and Hörner et al [2007]). Students between the ages of 6 and 16 have to attend school. According to Hörner et al [2007] the structure of the education system is the following: eight years of basic education plus two years of upper secondary education. Hence, the first affected cohort by this last reform were individuals age 14 (6+8) in 1998, born in 1984.

Compulsory foreign language classes: According to the Eurydice country report on the Czech Republic [2001a], with the end of communism in 1989 compulsory teaching of Russian was immediately abandoned, and students could choose their compulsory foreign language among English, German, French, Spanish (and also Russian), see Eurydice [2001b]. During the 1990's compulsory foreign languages classes started at age 10, see Eurydice [2012a]. Hence, the first affected cohorts were individuals born in 1979. Different from the Czech Republic, in Slovakia Italian is also an option, see Eurydice [2001b]. Given that the two countries separated in 1993, anything different has to start then. We hence assume that the cohort born in 1983 was the first to also be able to choose Italian.

Slovenia: Note that before 1990, Slovenia, as well as two other countries in our sample (Croatia and Macedonia) were part of the country of Yugoslavia.

Length of compulsory education: In 1950, a law was passed extending the length of compulsory schooling from 7 to 8 years. According to Hörner et al [2007], in Slovenia this law was enforced in 1958. The reform added one additional year to the comprehensive 7-year school, and individuals thus had to start attending school between age 7 and age 15 (see Schöpflin [1986]). Hence, the first affected cohort were those age 7 in late 1958, born in 1951. For our sample that includes cohorts born between 1964 and 1987, this implies that there are hence no effective changes to the length of compulsory education. A recent reform passed in 1996 and introduced throughout the country in 2002/3 (see Hörner et al [2007]) made compulsory education obligatory for nine years, from age 6 to 15. This

reform hence first affected individuals turning 6 in 2003/02, born in 1997/98. This recent reform does not affect cohorts in our sample.

Compulsory foreign language classes: In 1958, compulsory foreign languages were introduced into the curriculum of the comprehensive 8 year school in all of Yugoslavia. Students in 5th grade (see Tomich [1963]), at age 10, had to choose English, German, or French (or Russian) (see Eurydice report on Slovenia [2001a]). However, during the 1960's this choice was reduced to English and German (see Eurydice [2001b]). Hence, cohorts born in the 1950's or later were affected by the introduction of English and German. In 1981 and 1985, Italian and French were added to the choice of compulsory foreign languages (see Eurydice report on Slovenia [2001a]), first affecting cohorts born in 1971 and 1975 respectively.

Spain: Length of compulsory education: According to Brunello, Fort and Weber [2009], in 1970 the length of compulsory education increased from 6 to 8 years (school attendance: age 6 to 14). Following Brunello, Fort and Weber [2009], this first affected those age 6 in 1970, born in 1964. For our sample that includes cohorts born between 1964 and 1987, this implies that there are hence no effective changes to the length of compulsory education. In 1990, the length of compulsory schooling was again increased by 2 years up to 10 years, see Garrouste [2010]. The new structure consists of primary education of 6 years, age 6 to 12, and lower secondary education of 4 years, ages 12 to 16. This last reform hence first affected individuals age 12 in 1990, born in 1978.

Compulsory foreign language classes: According to the Eurydice country report on Spain [2001a], in 1990 foreign languages became compulsory for all students from age 8 onwards, hence affecting those born in 1982 or later. Before, foreign language classes were only compulsory for students age 14-18, while compulsory education ended at age 14. Hence, not all students were obliged to study foreign languages, see Eurydice [2001b]. According to the same source, today any foreign language may be studied, but the Eurydice country report on Spain [2001a] shows that in 1998/99, English was studied by 96.86% of students. There is no second compulsory foreign language, see Eurydice [2001b].

Sweden: Length of compulsory education: According to Brunello, Fort and Weber [2009], in 1962 the length of compulsory schooling was increased by one year to last 9 instead of 8 years. Children had to attend school between the ages of 7 and 16. According to Hörner et al [2007], this reform also introduced the nine-year comprehensive school, and hence the first to be affected by this change were individuals of school-entry-age 7 in 1962, born in 1955. For our sample that includes cohorts born between 1964 and 1987, this implies that there are hence no effective changes to the length of compulsory education.

Compulsory foreign language classes: According to the Eurydice country report on Swe-

den [2001a], English became the first compulsory foreign language for all students from age 10 onwards in 1962. This reform hence first affected those born in 1952. Since, 1994 a second compulsory foreign language has to be studied from age 12 onwards, which first affected those born in 1982, see Eurydice [2001b]. Students can choose German, French or Spanish as a second foreign language.

United Kingdom: Length of compulsory education: According to Murtin and Viarengo [2011], in 1973 the length of compulsory education increased from 10 to 11 years. Children age 5 to 16 had to attend school. According to Hörner et al [2007] the structure of the education system is as follows: infant school for ages 5-8, junior school for ages 8-12 and high school for children age 12-16. The reform increased the number of years in high school, and hence it first affected individuals age 12 in 1973, born in 1961. For our sample that includes cohorts born between 1964 and 1987, this implies that there are hence no effective changes to the length of compulsory education.

Compulsory foreign language classes: According to the Eurydice country report on the UK [2001a], since 1988 all students at age 11 have to learn at least one foreign language. This reform hence first affected students born in 1977 or later. Choices of foreign languages are French, German, or Spanish.