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Changing Language Skills and Trade in Europe

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Abstract

I investigate the effect of changing language skills on trade using an unique panel data set on spoken language. It tracks over thirty, mostly European, countries from the mid-90s to the beginning of the 2010s. In this period, European countries have witnessed an advancing trade integration and large changes in foreign language knowledge. I estimate a significant and positive effect of changing common English skills on trade using the gravity model and controlling for endogeneity by pair fixed effects and a globalization trend. General equilibrium welfare analysis shows that all countries except for Russia profited from the rise in the percentage of English speakers. Further, in a re-estimation of Fidrmuc and Fidrmuc (2016), I find a significant causal impact of aggregate common spoken language on trade, but not for any specific language.

JEL Classification: F14, F15, Z13

Keywords: language, international trade, gravity model

1 Introduction

Trade economists eagerly tried to explain the causes of the unprecedented trade integration that took place in the two decades before the trade collapse in 2009. The gravity literature has shown positive, significant and plausibly exogenous effect of preferential trade agreements on trade (Baier and Bergstrand 2007; Baier et al. 2019). A decreasing distance elasticity was documented by Yotov (2012) and Bergstrand et al. (2015), hinting to falling costs in international trade relative to domestic trade.

Bilateral trade costs, however, also include trade barriers related to different laws, ethnics, religions or languages (Anderson and Van Wincoop, 2004). Usually, these measures are assumed to be either constant or changing only slowly over time. One exception are foreign language skills: A language can be learned within a few years, basics in even shorter time. Decreasing language barriers could have led to falling trade costs, via ease in communication and increased trust between speakers (Melitz, 2008). Additionally, they could have contributed to expanding networks in international trade (Chaney, 2014).

I investigate the effect of changing language skills on trade in over thirty, mostly European, countries from the mid-90s to the beginning of the 2010s. In this period, European countries have witnessed an advancing trade integration and large changes in foreign language skills. An increasing number of people learned to communicate in English. At the same time, Russian knowledge declined in many countries of the former Eastern Bloc. I estimate the effect of changing spoken language on trade in a panel data analysis in the gravity model of trade.

To my knowledge, I am the first who uses time-varying data on language in a gravity framework, although Melitz (2008) emphasized non-constant language data as an important next step in the research on language and trade. Language variables have so far been constant in the gravity literature, mainly because of data limitations. I contribute to the literature by (i) using panel data to estimate the effect of a *change* in language skills, (ii) discussing a non-constant effect of changing language skills on trade, (iii) estimating a presumably causal effect, using country-pair fixed effects and trends for general trade integration to control for endogeneity and testing for strict exogeneity of my language variable with a 'feedback test', proposed by Wooldridge (2002) and already used in the gravity literature by Baier and Bergstrand (2007).

However, I am not the first who studies the effect of language on trade in Europe. Fidrmuc and Fidrmuc (2016) investigate trade between Eastern and Western European countries, where the Iron Curtain led to an exogenous divergence in language skills. This 'natural experiment' enabled them to estimate a potentially exogenous effect of language on trade. They find that English and German have a significant and positive impact on trade between East and West, using language data from 2005. I revise their empirical findings, taking into account the change in foreign language skills over 10 years by using language data from the mid-90s. Furthermore, I make use of the most recent methodological developments in gravity literature and estimate the effects by a two step CANOVA approach, following Egger and Nigai (2015).

This paper is structured as follows. I shortly present the theory of structural gravity in section 2. I introduce the unique panel data set on language in 3 and insights drawn from it in section 4. In section 5, I estimate the impact of a change in common spoken language on trade and also perform an estimation of the trade and welfare effect of the changes in language

skills, using the general equilibrium properties of the structural gravity model. Finally, I re-estimate the causal effect of levels of common spoken language using the 'natural-experiment' environment described by Fidrmuc and Fidrmuc (2016) in section 6. Section 7 concludes.

2 Structural Gravity

The gravity equation of trade, first estimated by Tinbergen (1962), assumes that trade can be explained in a similar way as the gravity force between two objects, which rises proportionally with the mass of the objects and inversely with the distance between these objects. Anderson and Van Wincoop (2003) underpinned the empirical gravity equation with a theory of 'structural gravity' which included 'multilateral resistance terms' to capture the remoteness of a country pair to all other countries.

Eaton and Kortum (2002) established a link to the existing trade theory by deriving a gravity equation from a Ricardian model in the lines of Dornbusch et al. (1977). Instead of the ad-hoc assumption of product differentiation by country, differences in technology are the drivers of trade in this model. In the following, I shortly describe their gravity model, which leads to the same results as the demand side model of Anderson and Van Wincoop (2003).

Eaton and Kortum (2002) consider a world consisting of $i = 1, \dots, N$ countries. As in Dornbusch et al. (1977), there is a continuum of goods, $l \in [0, 1]$, where country i 's productivity in producing good l is denoted with $z_i(l)$. Consumers preferences are assumed to be homothetic and identical across countries. Consumers from country j , by choosing their consumption quantities $q(l)$, maximize a constant elasticity of substitution (CES) utility function. The elasticity of substitution among different goods l is given by σ .

Assuming constant returns to scale, the costs of producing one unit of good l in country i and delivering it to importer country j is given by $p_{ij}(l) = \frac{c_i}{z_i(l)} t_{ij}$, where c_i denotes the input costs in country i and $t_{ij} > 1$ the iceberg trade costs from exporter i to importer j . $p_{ij}(l)$ is what consumers from j pay under assumed perfect competition for good l from country i . However, since consumers can choose from all N countries in the world, the price they pay for good l is $p_j(l) = \min\{p_{ij}(l); i = 1, \dots, N\}$.

Country i 's efficiency in the production of good l is a realization of a random variable Z_i that is drawn independently for each l from its country-specific probability distribution $F_i(z) = Pr[Z_i \leq z]$. Country i 's efficiency is drawn from a Fréchet distribution, $F_i(z) = e^{-A_i z^{-\theta}}$, with $A_i > 0$ and $\theta > 1$.

Following this model of Eaton and Kortum (2002), the probability that country i provides good l at the lowest price to country j is given by

$$\pi_{ij} = \frac{A_i c_i^{-\theta} t_{ij}^{-\theta}}{\sum_{k=1}^N A_k c_k^{-\theta} t_{kj}^{-\theta}}, \quad (1)$$

which is also the fraction of goods importer j obtains from country i . Multiplying 1 with total expenditures of country j , E_j , gives the exports from i to j ,

$$X_{ij} = \frac{A_i c_i^{-\theta} t_{ij}^{-\theta}}{\sum_{k=1}^N A_k c_k^{-\theta} t_{kj}^{-\theta}} E_j. \quad (2)$$

The effect of changes in trade costs on trade between countries i and j can be calculated as partial equilibrium effects, holding output, expenditures and multilateral resistance terms constant. Taking into account that these variables are also dependent on trade costs, general equilibrium trade and welfare effects can be estimated. This is due to the properties of the multilateral resistance terms and given an estimate of the elasticity of trade with respect to trade costs, σ . However, for theory-consistent and meaningful estimates of multilateral resistance terms, one has to include internal trade (Head and Mayer, 2014).

Baier et al. (2019) derive a simple general equilibrium model, starting from equation 2. The model focuses only on trade in final goods. There is just one sector, which best suits aggregated trade. Trade values are normalized by holding total nominal output in the sample constant. Baier et al. assume that labor is the single factor of production and input costs in country i equal wage in country i , $c_i = w_i$. Output is defined as $Y_i \equiv L_i w_i = \sum_{j=1}^N X_{ij}$. Expenditures and output of countries i can diverge because of trade imbalances D_i , such that $E_i = Y_i + D_i$. Then, from equation 2 it follows that

$$L_i w_i = \sum_{j=1}^N \frac{A_i w_i^{-\theta} t_{ij}^{-\theta}}{\sum_{k=1}^N A_k w_k^{-\theta} t_{kj}^{-\theta}} (L_j w_j + D_j) \quad \forall i. \quad (3)$$

The system of equations in 3 can be solved 'in changes', using the 'hat algebra' introduced by Dekle et al. (2007), where $\hat{x} = x'/x$ denotes the difference between the counterfactual, x' , and the baseline scenario, x . Given an initial change in trade costs, \hat{t}_{ij} , the 'equilibrium in changes' can be written as

$$\hat{w}_i Y_i = \hat{w}_i^{-\theta} \sum_{j=1}^N \frac{\pi_{ij} \hat{t}_{ij}^{-\theta}}{\hat{P}_j^{-\theta}} (\hat{w}_j Y_j + D_j) \quad \forall i, \quad (4)$$

where $\hat{P}_j^{-\theta} = \sum_{i=1}^N \pi_{ij} \hat{w}_j^{-\theta} \hat{t}_{ij}^{-\theta}$. To compute full endowment general equilibrium effects, all that is needed are initial trade shares, π_{ij} , output and expenditure levels, Y_i and E_j respectively, and a set of changes in trade barriers, \hat{t}_{ij} .

Difference in welfare between baseline and counterfactual scenario is defined as

$$\hat{W}_i = \hat{E}_i / \hat{P}_i, \quad (5)$$

where $\hat{E}_i = (\hat{w}_i Y_i + D_i) / E_i$.

Difference in bilateral exports are given by

$$\hat{X}_{ij} = \frac{\hat{w}_i^{-\theta} \hat{t}_{ij}^{-\theta}}{\hat{P}_j^{-\theta}} \hat{E}_j. \quad (6)$$

I make use of this simple model in section 5.3 to estimate the trade and welfare effects of a change in spoken language in the sample, using the partial effects obtained in section 5.2. For the computation in Stata, I use the `ge_gravity` command by Baier et al. (2019).

3 Data

3.1 Trade Data and Control Variables

My source of data on international bilateral trade in goods is the 2020 version of *CEPII's BACI* database. It contains trade data between over 200 entities¹ and more than 5000 products at HS92 6-digit level between 1995 and 2018. The database is built from *UN Comtrade* data, but corrects for various inconsistencies. Most importantly, it enlarges the country coverage by estimating mirror trade flows, i.e. reported CIF (cost, insurance and freight) imports from country i to j are reported FOB (free-of-board) exports from country j to i (Gaulier and Zignago, 2010). Some countries from the original *BACI* trade data have been dropped either because data on explanatory variables is missing or because they dissolve during the observed time span (e.g., Serbia and Montenegro split up in 2006).

In gravity literature, it is common now to include domestic trade for several reasons. First, it is consistent with theory, which includes a country's trade with itself (Yotov et al., 2016). Second, I can account for trade diversion from domestic to international trade (Dai et al., 2014). Third, it enables me to consistently estimate the multilateral resistance terms by importer and exporter fixed effects with a Pseudo-Poisson maximum likelihood estimator (Fally, 2015).

Such internal trade has to be constructed from gross production data, which is for most countries only available for the manufacturing sector. Hence, the literature focuses on trade in manufacturing goods. I use *CEPII's TradeProd* data set for the analysis of international and intra-national trade, which reports data from 1980 to 2006. It consists of international manufacturing trade data from *BACI* and data on gross production from *Worldbank's Trade, Production and Protection* data set from Nicita and Olarreaga (2007) and complements it with data from *OECD* and *UNIDO Indstat*.

I use *BACI* and *UNIDO's Indstat 2* database in the version of 2020 to extend the internal trade data for the period from 2006 to 2018 and add some data for the period between 2000 and 2006. The freely available *Indstat 2* database reports data on gross production from 2000 to 2018 by ISIC 3 2-digit code for 174 countries, although there are gaps in the data. I use the *WITS concordance tables* to match manufacturing trade data from *BACI*, reported in HS92 6-digit code, to 23 ISIC 3 2-digit sectors. I construct domestic trade by sector by subtracting total exports by country and sector from gross production. I exclude the ISIC sector 'Recycling', since there is no trade reported for this sector. Finally, to combine my constructed data with the *TradeProd* data, I merge the 22 ISIC 3 2-digit sectors and the 28 ISIC 2 2-digit sectors to the 8 sectors usually used in the gravity literature (Bergstrand et al., 2015; Anderson and Yotov, 2016).²

¹For convenience, I call them 'countries', although some of them do not represent independent states.

²The industries are (1) Food, Beverages, and Tobacco Products; (2) Textile, Apparel, and Leather Products; (3) Wood and Wood Products; (4) Paper and Paper Products; (5) Chemicals, Petroleum, Coal, Rubber, and Plastic Products; (6) Other Non-metallic Products; (7) Basic Metal Products; (8) Fabricated Metal Products, Machinery, Equipment. The category 'Other manufacturing' is included in category (8). Data sometimes differs for the overlap between 2000 and 2006, but a correlation of .999 between *TradeProd* and my data for this period is reassuring. The small differences can be attributed to corrections in newer versions of the *Indstat 2* and *BACI* data on production and trade. Additionally, while *Indstat 2* is reported on ISIC 3, *TradeProd* is reported on ISIC 2. The differences between the versions can lead to minor differences in aggregated internal trade. If there is an overlap, I always chose the data from my constructed data set because *BACI* and *Indstat 2* is corrected

I face the same problems as Nicita and Olarreaga (2007) when they constructed the *Trade, Production and Protection* data set: for some observations, there is no data on internal trade, or it is not positive. This can be due to incomplete or wrong data on gross production if small firms are not covered or production is allocated to the wrong sector. Additionally, there could be discrepancies between the year of production and the year of export. The same problem occurs in *CEPII's TradeProd* data. To handle this issue, I follow in large parts Baier et al. (2019). First, I replace single missing sectors by linear interpolation between years. If internal trade is non-positive for up to three sectors, I replace them by the average expenditure share on domestic products in the respective year. In some years, there is no data on gross production at all. If the gap is only one year, I linearly inter- and extrapolate aggregated data from adjacent years.

The standard gravity variables are from *CEPII's Gravity* database. I update their data on colonial past by adding new data from www.worldstatesmen.org, the main source of *CEPII's Gravity* data set (Mayer and Zignago, 2011). I construct a dummy variable that equals one if two countries have been in a colonial relationship after 1945 (*COLPOST45*) and another variable that equals one if two countries had the same colonizer after 1945 (*SIBPOST45*). Additionally, I construct a dummy (*EMPIREBEFORE45*) that equals one if two countries belonged to the same (colonial) empire between 1815 (after the Congress of Vienna) and 1945, which I use in section 6. I add data on *CEPII's* other gravity variables (*CONTIG*, *COMCUR*, *GATT/WTO* and *EU*) as well. Data on regional trade agreements (*RTA*) are from *Mario Larch's Regional Trade Agreements Database* from Egger and Larch (2008).

For the logarithm of geographic distance (*LNDIST*), I use *CEPII's* population weighted bilateral distances. I follow Eaton and Kortum (2002) and assume a non-constant distance elasticity. Hence, I split the distance variable into six intervals.³

To control for other cultural influences, I use a fractional common religion variable (*RELIG*), which represents the probability that two randomly drawn individuals from two countries have the same religious affiliation. I count, e.g., two catholic Christians as members of the same religion, but not a catholic and a protestant. My main source of religious affiliation, the *World Religion Data* from Maoz and Henderson (2013), divides the world religion roughly into several subdivisions. In my data set, Christianity is divided into Catholic, Orthodox, Protestant and Others. Islam is divided into Sunni, Shia and Others and Buddhism into Mahayana (North-Eastern), Theravada (Southern) and Others. There is no subdivision for Hinduism and Judaism. Also included are smaller religions such as Taoism, Shinto or Sikh.

Of these control variables, only *COMCUR*, *GATT/WTO*, *EU* and *RTA* are time varying and can therefore be used in section 5. All other variables are only used in section 6.

Data and estimates on bilateral migration stock is from the *UN Population Devision, Trends in International Migration Stocks* from 2015, and supplemented by the *Worldbank's Bilateral Migration Matrix*. UN's data set includes estimates in five year intervals, starting in 1990. The *Bilateral Migration Matrix* reports estimates based on various sources for 2013 and 2017. For 44 of the 4096 observations in the sample, there is no migration in either direction. I generate

ex-post and therefore more reliable.

³Given the maximum distance of 20000 km, the intervals are: [0 km, 625 km), [625 km, 1250 km), [1250 km, 2500 km), [2500 km, 5000 km), [5000 km, 10000 km), [10000 km, 20000 km).

the variable $LN\text{MIGR}$ as the logarithm of the stock of immigrants from country j in i and emigrants from country i to j plus one, such that these observations are included as well. The impact of this manipulation is minor, since only 6 country pairs (in both directions and for more than one point in time) are affected. Moreover, only the difference between years is relevant for the estimation in section 5, since I control there for the average migrant stock by country-pair fixed effects.

3.2 Language Data and Variable Construction

Melitz and Toubal (2014) introduce a fractional variable that measures the possibility that two randomly assigned people from the populations of the country pair speak the same language, common spoken language (CSL). I construct a time-varying version of this variable with data on spoken language for all countries in the sample at each point in time. I also construct a panel data set on common native language, which I use in the descriptive statistics in section 4 and for a measure of linguistic proximity in section 6.

The main source of data on native and spoken language are the *Eurobarometer* surveys. For the EU-28 and Turkey, the *Eurobarometer* surveys on Language from 2005, 2010 and 2012 are used. For the EU-15⁴, I use three *Eurobarometer* surveys from the mid-90s and four from 1998 to 2001.⁵ For the new member states of the European Union and Turkey, I use the *Candidate Countries Eurobarometer* surveys from 2001 and 2002 as well as four of the *Central and Eastern Eurobarometer* surveys conducted between 1993 to 1997. If there is more than one source per period, e.g. the *Eurobarometer* surveys from 1994, 1995 and 1998 for $t = 1996$, I take the average of these observations. This procedure should guard against outliers that might occur because of the small sample size in the surveys.

The surveys contain about 1000 observations per country, except for Malta and Luxembourg with only 500 observations. For each survey, new, independent and representative samples were drawn. The respondent had to be 15 years or older. In the surveys, the question of interest was: 'Which language do you speak well enough to have a conversation with?'. Fortunately, the phrasing of that question is always similar, so that the results of the different surveys should be comparable.

The *Eurobarometer* surveys are completed by census data, which usually includes questions on mother tongue and spoken language in the former Soviet Republics. For Armenia and Georgia, I use the *Caucasus Barometers* from 2008 to 2013 as well. I also counter check the data with *Ethnologue*, the *CIA Factbook* and language data from Melitz and Toubal (2014), available at *CEPII*. I am able to correct some mistakes in the *Eurobarometer* surveys for the Baltic states⁶. I also include Canada and the United States in the sample because both countries are

⁴The EU-15 consists of the following member states: Belgium, Germany, France, Italy, Luxembourg, the Netherlands, Denmark, Ireland, Greece, Spain, Portugal, Austria, Finland and Sweden. Belgium and Luxembourg are combined to one country in my data set since for several years, trade data cannot be disentangled for them.

⁵The numbers of the Standard and Special *Eurobarometer* surveys, available at the *GESIS* database (www.gesis.org), are 39, 41, 44, 50, 52, 54 und 55.1.

⁶More precisely, the percentage of Russian speakers is way smaller in the surveys than in the censuses, while the percentage of English speakers and the speakers of the country's official language - Estonian, Latvian and Lithuanian, respectively - is larger. A possible reason might be that the *Eurobarometer* surveys only interviews citizens of the European Union in their surveys from 2005 to 2012. However, a part of the Russian minority in the Baltics does not own a citizenship of the respective country they live in, since speaking some level of the

main trading partners and destination of migrants from Eastern Europe. Canada has detailed data on native and spoken language in their censuses, which take place every five years. For the U.S., I use census data and data from the *American Community Survey Reports*.

Unfortunately, I have to exclude Georgia and Croatia from the econometric analysis because of missing internal trade before 1998. I end up with the following 32 countries for the panel data set in section 5: the EU-27 (not including the newest member, Croatia), Turkey, Russia, Kazakhstan, Armenia, the U.S. and Canada. The countries are listed in table A.2 in appendix A.

The cross-sectional data set used in section 6 contains 37 countries in the mid-90s. The additional five countries, for which I only got data from the 1990s, are Ukraine, Northern Macedonia, Serbia and Montenegro and Albania from the *Central and Eastern Eurobarometer* surveys and Norway from a *Eurobarometer* survey from 1994.

Given the data, the construction of a constant *CSL* variable is relatively easy. For each language l and exporter i at time t , I multiply the percentage of speakers in the population, $SL_{il,t}$, with the percentage of speakers of language l in importer's country j at time t , $SL_{jl,t}$. Then, $\alpha_{ijl,t} = SL_{il,t} \times SL_{jl,t}$ is the probability that two individuals drawn randomly from the population speak the same language l at time t . I could now sum up over all languages and receive $\alpha_{ij,t}$. In some cases though, the sum would exceed one, because people can speak more than one language. Since there is no meaningful interpretation for a probability beyond one, some kind of normalization is needed. Melitz and Toubal (2014) pick the language for which α_{ijl} is highest, lets say $\max(\alpha)_{ij}$, and compute common spoken language as $CSL_{ij} = \max(\alpha)_{ij} + (\alpha_{ij} - \max(\alpha)_{ij})(1 - \max(\alpha)_{ij})$. I refine this measure by iteratively calculating $CSL_{ij} \forall t$ as follows:

$$\begin{aligned}
 CSL_{ij,1} &= \alpha_{ij,1} \\
 CSL_{ij,2} &= CSL_{ij,1} + (1 - CSL_{ij,1})\alpha_{ij,2} \\
 CSL_{ij,3} &= CSL_{ij,2} + (1 - CSL_{ij,2})\alpha_{ij,3} \\
 &\dots \\
 CSL_{ij} &= CSL_{ij,l-1} + (1 - CSL_{ij,l-1})\alpha_{ij,l} \quad \forall t
 \end{aligned}$$

For one or two common languages, and thus in most cases, both methods are the same. But even for the case that there are three or more common languages for a country pair, e.g. *CSL* for Belgium and the Netherlands, the measure can never exceed one. In addition, one does not have to assign $\max(\alpha)_{ij}$. The measure is always the same, no matter the sequence in which the languages l are added.

However, this normalization does only estimate the language overlap between two or more languages. 'Language overlap' I define here as the percentage of the population speaking two

respective official language of the country is mandatory for this. Census data also shows that English is less commonly spoken in the group of Russians in the Baltics. Consequently, I use census data from 2009-10 for the Baltic states and interpolate Russian, English and the respective official language for 2005.

Variable	Mean	Std. Dev.	Min	Max
<i>CSL</i>	.303	.260	.004	1
<i>WTO</i>	.782	.413	0	1
<i>RTA</i>	.651	.477	0	1
<i>EU</i>	.382	.486	0	1
<i>COMCUR</i>	.112	.319	0	1
<i>LN Migr</i>	8.589	3.077	0	19.410

Table 1: Summary statistics

or more languages that are relevant for the country pair, e.g. Dutch, French, English and German for the pair Belgium-Netherlands. Communication between two individuals needs only one common language, the other languages are redundant. Since I don't have data on the individual level for all country pairs, I have to estimate the language overlap. My method assumes an average overlap, although for most pairs every size of the language overlap is possible, from a total overlap to no overlap at all.⁷

In general, there are many zeros in *CSL*. Since *CSL* are products of the percentages of speakers, many different combinations can lead to the same value of *CSL*. E.g., a value of *CSL* of 5 percent can be the product of a hundred percent of the population in country i and five percent in country j speaking a common language, or a product of ten percent in i and fifty percent in j . The *CSL* measures can't capture differences of that kind.

For section 6, I account for linguistic similarities between countries with the variable *LP0*. I construct a linguistic proximity variable using data on native language and the Levenshtein distance between languages, following Melitz and Toubal (2014). Data on Levenshtein distance is from the Automated Similarity Judgment Program (ASJP). I calculate the primary language(s) for each countries, according to their largest native languages. I normalize the primary languages such that they sum up to one. E.g., for the USA, the primary languages are English (.86) and Spanish (.14) in 2011 and for the UK, the only primary language is English with a value of one. Then, for each language in each country pair, I compute the linguistic proximity. Because both the proximity between languages and the sum of the primary languages neither exceed one nor is lower than zero, the measure of linguistic proximity ranges from 0 to 1. *LP0* serves as an additional variable to count for linguistic proximity besides a common language. Thus, it only measures linguistic links between different native languages and is zero for same languages. *LP0* is comparable to Melitz and Toubal (2014) LP(ASJP) variable.

4 Changes in Foreign Language Skills

Table 1 reports the summary statistics of the explanatory variables. The data set consists of 4096 observations, 1024 in each year. The average *CSL* is rather high because the sample is linguistically relatively homogeneous, in the sense that it mainly consists of Indo-European languages. Furthermore, international relations between most of the countries lasted for quite some time, which led to a high level of foreign language knowledge. Moreover, in all states of the former Eastern Bloc, learning Russian was compulsory.

A large and over time increasing percentage of countries were members of the World Trade Organization or a Preferential Trade Agreement. The period under observation also includes two EU enlargements, 2004 and 2007, respectively. Since I also use a lagged variable of EU in 5, I also capture a potential lagged effect of the EU enlargement in 1995. All EU members formed a RTA with the current EU before joining. However, there was an often considerable lag between the trade agreement and the accession. *COMCUR* represents the introduction of the Euro and adaption of it by some Eastern and Southern European countries between 2006 and 2011.

I consider 47 different languages that are spoken in at least 2 countries by at least 1 percent of the population. Thus, languages such as Welsh, Basque or Irish are not considered, although they are spoken by a significant part of the population in one country. A full list of all languages are given in table A.1 in the appendix A. The main languages, however, are English, French, German and Russian. Spanish, Italian and Turkish are also of considerable size.

Table 2 presents the fraction of native speakers and total speakers in the sample's total population for the main languages in the sample. In 2011, about 30 percent of the 32 countries' population spoke English as mother tongue, and additional 25 percent spoke English as foreign language, which adds up to 55 percent. I.e., more than half of the more than a billion people considered in this sample claim to speak English. Russian is spoken by about 12 percent as mother tongue and by 5 percent as second language. Russian is mainly spoken in the former Eastern Bloc, but seldom in the Western countries. French and German are widespread foreign languages for historical reasons, spoken in almost all countries in the sample by at least a small fraction.

The table also shows the evolution over time. Most remarkably, the percentage of L2-speakers in English increased by around 7 percent within only 15 years, which are about 90 million English L2-speakers more. In the same time, the percentage of Russian speakers declined by 2.5 percent, also due to a smaller number of native speakers. This can partly be attributed to a stagnating or even decreasing population in the Eastern European countries. The increasing fraction of Spanish native speakers can be assigned to the migration from Ibero-America to

⁷In the Eurobarometer, I construct the percentage of speakers out of data from around 1000 individuals per country. I test my normalization for the aforementioned country pair BEL-NLD and construct a dummy variable that is one if two individuals from Belgium and the Netherlands speak the same language for each of the about a million possible interactions in this sample. The mean of this dummy over the million observations gives the actual common spoken language I like to capture by *CSL*. The thus calculated value of *CSL* is 81,9 percent. My measure estimates *CSL* with 89,3 percent, which suggests an underestimation of the language overlap. If I simply sum up over all languages, $\alpha_{BEL,NLD} = 1.56$. For another country pair, Belgium and France, the corresponding values are 0.825, 0.837 and 1.03, respectively. Given the high computational effort needed and the lack of data for many countries, I rather stick to the calculation as described in the main text.

Language		fraction of total population (in percentage points)			
		1996	2001	2006	2011
English	native	29.75	30.12	30.47	30.55
	spoken	47.36	50.55	55.15	55.08
French	native	6.95	6.98	6.89	7.01
	spoken	13.06	12.61	13.92	12.09
German	native	8.31	8.67	8.25	7.82
	spoken	13.45	13.79	14.87	13.10
Italian	native	5.98	5.83	5.56	5.53
	spoken	6.84	6.75	6.89	6.64
Russian	native	14.25	13.06	12.86	12.38
	spoken	19.53	18.50	18.66	17.02
Spanish	native	5.97	6.77	7.19	7.46
	spoken	9.19	10.03	11.39	11.84
Turkish	native	5.27	5.70	6.25	6.47
	spoken	6.24	6.64	6.71	7.02

Table 2: Fraction of L1 and L2 speakers by language and year in the panel

the United States. Still, the fraction of Spanish L2-speakers increased by 2 percent in the other countries, which hints to a growing interest into Spanish as foreign language. The other languages are quite stable over time, at least when looking at the whole sample’s population.

Figures 1 and 2 display the percentages of English and Russian speakers in Europe by country, respectively. The maps do not show North America, since there were no major changes for these two languages. Furthermore, Croatia, Georgia are covered, and Luxembourg and Belgium have a separate entry. The shading of the countries indicates the fraction of speakers in 2011, while the numbers represent the change in the fraction since the mid-90s.

In figure 1, it can be seen that English is wide spread in the Nordic and German countries as well as in the Netherlands and the former British colonies Malta and Cyprus. Interestingly, English is nowadays quite common in many new member states of the European Union. In Russia and Kazakhstan, less than 10 percent of the population speak English. The diverge between East and West, emphasized by Fidrmuc and Fidrmuc (2016), yet still remains. At the beginning of the 2010s, more than two thirds of the population in the West (including North America and Turkey) were able to communicate in English. Only a fraction of 14 percent spoke English in the former Eastern Bloc. Russian still is the *lingua franca* in the East. Two thirds of the population of the countries in the sample speak it there, but only 1-2 percent in the Western countries.

But English was spoken to a lower degree in the mid-1990s in the former Eastern Bloc. Only 7 percent were able to speak it, according to the *Eurobarometer* surveys. As indicated by the numbers in red in figure 1, there has been a rise in English skills both in Eastern and Western Europe. Apart from the countries where English is the main language and therefore already at a very high level, the fraction of English speakers has grown by more than 10 percent in any of today’s member states of the European Union, in some cases by over 20 percent, e.g. in the

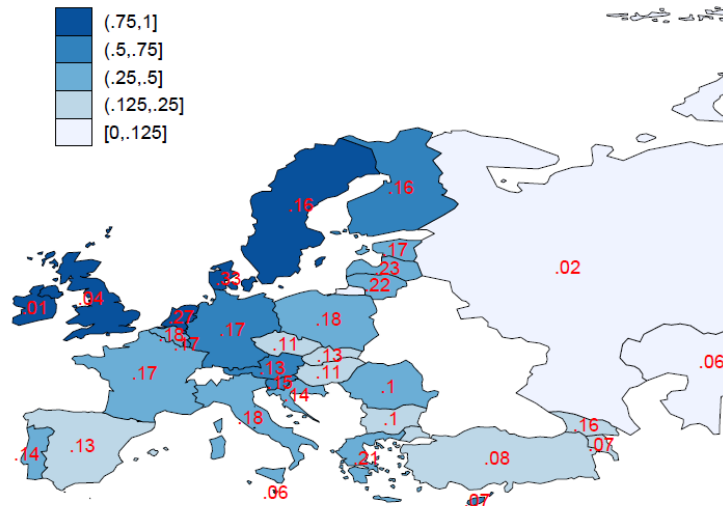


Figure 1: Fraction of English speakers in 2011 and change from 1996-2011

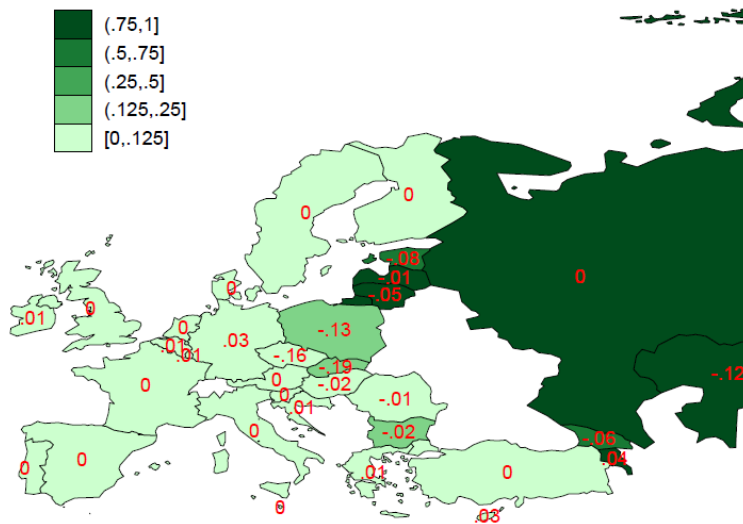


Figure 2: Fraction of Russian speakers in 2011 and change from 1996-2011

Baltic states and Denmark.

Figure 2 shows that at the same time, the fraction of Russian speakers declined in the East. Yet, there are differences between the countries. In Central Eastern Europe, the percentage of speakers fell to a large degree. In Hungary and Romania, Russian was not that common, possibly for political reasons and because both countries' native languages are not Slavic ones. In the Baltics, Russian kept being a *lingua franca*, although without official status. In the former Soviet Republics in the sample, Russian is still the most spoken language, despite a decline in the fraction of Russian speakers in the population. In the Western countries, Russian speakers only make up zero to four percent of the population in any country, except for Germany.

It is crucial to reflect on the reasons behind these changes in foreign language skills. First, after the Dissolution of the Soviet Union, today's members of the European Union abandoned Russian as official and as compulsory language in school to further disintegrate from former Soviet Union countries (Pavlenko, 2008). Second, the European Union seek to improve foreign

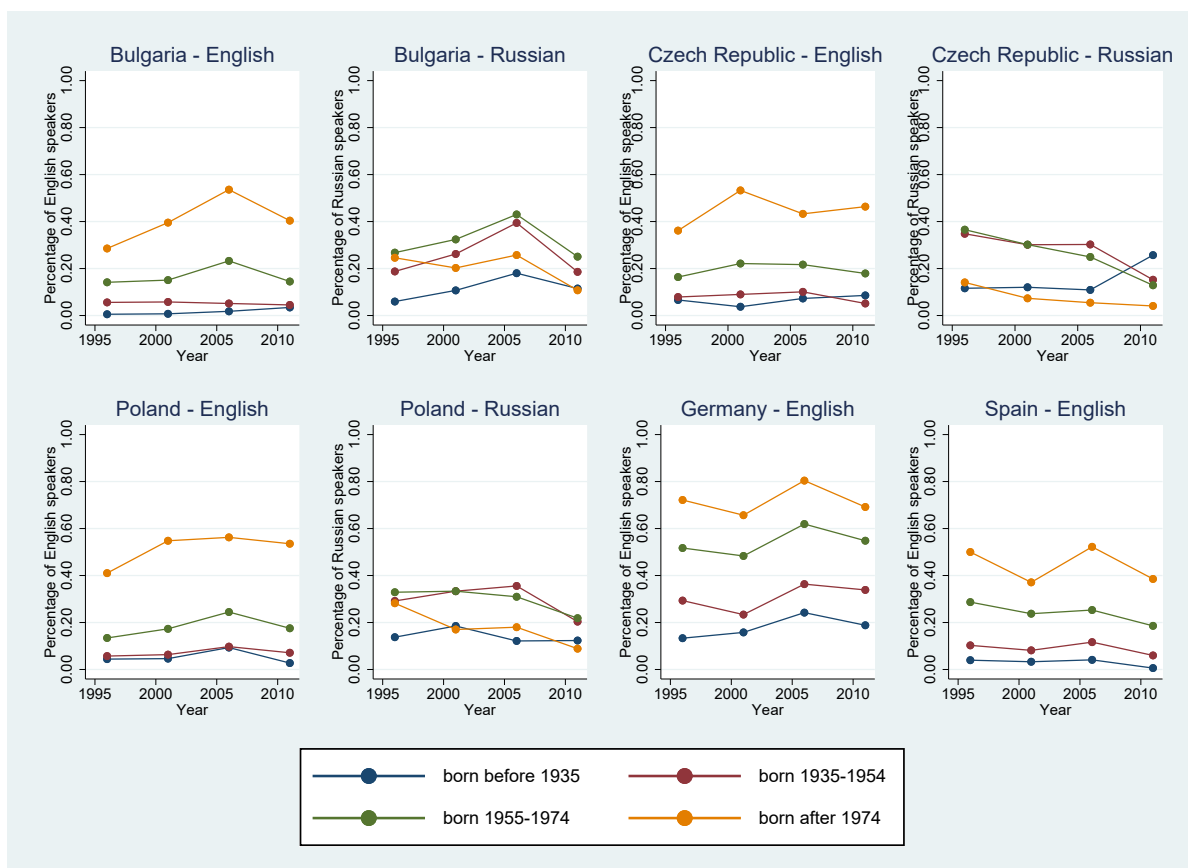


Figure 3: Spoken language by age cohorts from 1996-2011 in selected countries

language skills to "opening-up to the wider world" (European Council, 2002, p. 19). In 2002, the European Council emphasized "to improve the mastery of basic skills, in particular by teaching at least two foreign languages from a very early age" (European Council, 2002, p. 20). English was not explicitly stated, but obviously the preferred choice by the member states. Over the last decades, language schooling has expanded in the European Union: language schooling starts now earlier, years of education increased and schooling in a second foreign language was expanded (Eurydice, 2012). Third, the globalization raised the benefits of foreign language skills on the individual level. English as the most widely spoken language worldwide is a reasonable first choice.

I investigate these channels by a closer look into the data from the *Eurobarometer* surveys. Figure 3 presents the English and Russian skills in several example countries by age cohorts and over time. For all countries, both in Eastern and Western Europe, the percentage of English speakers is higher for the younger cohorts. Less than 10 percent of the population born before 1960 speak English in the East, but also in Western countries such as Spain. Germany represents the Indo-Germanic countries: English is widespread, also among the elderly.

In Eastern Europe, Russian skills are lower for the very old and the younger age cohorts. This is as expected, since Russian became a mandatory foreign language in school after the World War II in the countries of the Warsaw Pact, except for Romania. It is plausible that many pupils chose English instead of Russian after the Fall of the Iron Curtain, now that

Russian was not mandatory anymore. In some countries, the policy change went even further, with sometimes negative consequences. In Latvia, Russian minority language schools switched the instruction language from Russian to 60 percent Latvian, 40 percent Russian in 2004. Ivlevs and King (2014) show that this language policy resulted in lower exam results in the Russian minority compared to the Latvian majority. In Kazakhstan, the national Kazakh language was promoted by politics. Only in 2011, English was introduced besides Kazakh and Russian (Ginsburgh and Weber, 2020). These examples indicate that the first and foremost interest of former Soviet Republics was to strengthen the respective national language, sometimes to the expense of Russian.

Interestingly, the age cohorts born before 1975 did not increase their English skills significantly over time. The changes in foreign language skills are mainly driven by the younger people with better foreign language knowledge, slowly replacing the older cohorts over time. Adult education did not seem to play a major role, so the changes are most likely driven by language lessons in school.

According to the *Eurobarometer* survey from 2012, language schooling is the most important way to learn a language in Europe. About 70 percent of the European citizens learned a second language at school and 45 percent found language lessons in school to be most effective. Other ways of language learning are less common and judged less effective. Again, there are differences by age groups. While 87 percent aged between 15 and 24 learned a language in school, only two thirds of those aged between 55 and 64 did so. Consequently, language skills depend on education level. More than 69 percent of the Europeans that finished their education at the age of 16 or older can speak at least one foreign language. Only about 30 percent of those who finished earlier are still able to communicate in a foreign language. Thus, it is credible to attribute part of the general rise in English skills to intensified language schooling.

In conclusion, the EU education policy and the wish of Eastern European countries to partly replace Russian in school curriculum led to a language policy that raised English skills and reduced Russian skills in Europe. Raising economic and cultural integration, both intra-EU and extra-EU, was the goal of the EU politics. The decision of the Eastern countries to abandon Russian was also driven by political and national, not only economic reasons. Part of the changes in common spoken language might therefore be exogenous, although both individual and policy choices are influenced by existing trade relations or the expectation of future trade integration. In the next section, I estimate the correlation between changing common spoken language and bilateral trade in a gravity framework and try to estimate an exogenous effect of language using several methods to control and test for endogeneity.

5 The Impact of Changing Spoken Language on Trade

5.1 Empirical Strategy

The variable of interest in this analysis is $CSL_{ij,t}$, common spoken language. In the same way as Baier and Bergstrand (2007) did it for FTAs, I estimate the average partial effect of CSL on trade with a three-way fixed effects model presented in equation 7. As recommended by Santos Silva and Tenreyro (2006), I use the PPML estimator. $\mu_{i,t}$ and $\pi_{j,t}$ capture the outward and

inward multilateral resistance terms of the structural gravity equation (Fally, 2015).

$$X_{ij,t} = \exp(\mu_{i,t} + \pi_{j,t} + \delta_{ij} + \beta_1 CSL_{ij,t} + \beta_z Z_{ij,t}) \times \epsilon_{ij,t} \quad (7)$$

I control for reverse causality of CSL , i.e. that individuals have learned the language of the trading partner in the past because of historical economic relations, by directional country-pair fixed effects, δ_{ij} . Unlike a parametric model, the set of country-pair effects explains all constant cross-country variation and thus reduces the potential bias caused by unobserved trade costs (Egger and Nigai, 2015). With δ_{ij} included in the model, the *level* of CSL does not affect the estimation, only the *change over time*. Since CSL is time-varying, I am able to estimate an average treatment effect of the change in common spoken language, $CSL_{ij,t} - CSL_{ij,t-5}$ (Wooldridge, 2002).

I add a set of time-varying control variables, $Z_{ij,t}$, that account for political integration and migration. $Z_{ij,t}$ includes regional trade agreement (RTA), membership in the WTO (WTO), the European Union (EU) or a currency union ($COMCUR$). Additionally, I include one lag of EU and RTA to account for 'phasing-in' effects (Baier and Bergstrand, 2007), such as the temporarily suspended freedom of movement for workers from New European Union member states in the EU enlargement in 2004. I also include the natural logarithm of the bilateral migrant stock, $LNMIGR$.

Bergstrand et al. (2015) and Baier et al. (2019) control for globalization effects, such as improved communication and transportation technology, that generally increase international trade over time. They argue that otherwise, the estimated coefficients are biased upwards. They propose a dummy variable that takes the value of one for international trade for each year t , and zero otherwise. Estimating the variable $INTERNAT$ in the regression 8 for each year is not possible because of perfect collinearity with the fixed effects, which is why I exclude the base year. The coefficients are to be interpreted relative to 1996. Adding the globalization trend is especially important for estimating the effect of common spoken languages, because innovation in communication technology raises benefits from foreign language skills tremendously.

Furthermore, I include a similar variable, $EASTWEST$, that controls for trade growth between the former Eastern Bloc and all other countries in the sample. It equals one if one trading partner is a former Eastern Bloc country and the other not, and zero otherwise. Again, the coefficients are estimated against the base year 1996. After the Fall of the Iron Curtain, East-West trade literally started from zero because of former prohibitive trade restrictions. Trade might have grown faster between Eastern and Western countries than within the West and the East. Trade networks were literally non-existent before 1991, but the costs of establishing them, formerly prohibitively high, now were relatively low compared to already well linked Western Europe. Hence, trade might converged faster to a 'natural' level for East-West trade, i.e. grew faster than other trade.

Disdier and Mayer (2007) and Guiso et al. (2009) use data from *Eurobarometer* surveys to show that bilateral opinions and trust have a positive effect on trade. Besides common spoken language, bilateral trust might have changed over time as well. Since common language is often related to increased bilateral trust (Egger and Lassmann, 2012; Spring and Grossmann, 2016), it would be interesting to include a control variable for bilateral trust. Unfortunately, the surveys

stopped asking questions about bilateral trust and opinions by the beginning of the 2000's. The trends for *INTERNAT* and *EASTWEST* control for increasing trust, both in general and especially between Eastern and Western countries.

$$X_{ij,t} = \exp(\mu_{i,t} + \pi_{j,t} + \delta_{ij} + \beta_1 CSL_{ij,t} + \beta_z Z_{ij,t}) \times \left(\sum_t \beta_t INTERNAT_{ij} \times t + \sum_t \beta_t EASTWEST_{ij} \times t \right) \times \epsilon_{ij,t} \quad (8)$$

Although I control for historical trade costs, it is still possible that trade causes common language and not otherwise, i.e. there is a 'reverse causality' problem. I test this with a so-called 'feedback-test', described in Wooldridge (2002) and already used in a gravity framework by Baier and Bergstrand (2007). I include one lead of the language variable, $CSL_{ij,t+5}$, which must not be statistically different from zero to confirm strict exogeneity of the variable. If the lead variable has a positive and significant coefficient, future increases in language skills can explain contemporaneous trade, which violates the assumption of strict exogeneity of the explanatory variable.

5.2 Estimates of the Average Partial Effect

5.2.1 Common Spoken Language

The estimation results are presented in table 3. I do not report a pseudo R^2 , since it is always close to one due to the high explanation power of country pair fixed effects. I proceed in several steps: First, I estimate regression 7 without globalization- and East-West trend in column (1). Remarkably, the coefficient of *CSL* is about three times higher than usual estimates of the effect of language on trade, although I controlled for reverse causality with pair fixed effects and other time-variant variables, which all have a positive impact on trade integration, except for WTO membership. The change in spoken language yet might capture other channels that influenced trade and therefore be biased, i.e. increased bilateral trust or growing networks of trade.

In columns (2) and (3), I introduce step by step the trends from regression 8. International trade increased in all countries, as shown by the highly significant positive coefficient of *INTERNAT* in each year relative to the base year 1996. The *EASTWEST* trend is only significant in 2001 and 2011 and its inclusion renders *LNMIGR* insignificant, but does not change the results for common spoken language. Accounting for a general globalization trend diminishes the coefficient of *CSL* to a more plausible value. *CSL* did increase for most countries in the sample and hence captured a large part of the general increase in trade in column (1). The effect is still marginally significant. *Ceteris paribus*, an increase of ten percentage points in *CSL* is associated with an increase in international trade of $(\exp(0.43) - 1) \times 10 = 5.4$ percent.

RTA's coefficient also decreases from .73 to .54, but stays highly significant. The significant effect of an EU accession prevails, but there is no significant 'phasing-in' effect any more. The effect of *COMCUR* switches signs in column (2) and gets insignificant in column (3).

In columns (4) and (5), I apply the 'feedback test' for strict exogeneity on the variable of interest, *CSL*. I do this by adding one lead of the variable as regressor. This drops the last

	(1)	(2)	(3)	(4)	(5)
Dependent variable: $X_{ij,t}$					
$CSL_{ij,t}$	1.90 (0.29)***	0.40 (0.23)*	0.43 (0.23)*	1.75 (0.26)***	0.41 (0.27)
$CSL_{ij,t+5}$				1.47 (0.43)***	0.01 (0.36)
$RTA_{ij,t}$	0.72 (0.12)***	0.56 (0.10)***	0.59 (0.10)***	0.61 (0.09)***	0.46 (0.09)***
$RTA_{ij,t-5}$	0.46 (0.04)***	0.27 (0.05)***	0.19 (0.06)***	0.39 (0.06)***	0.18 (0.06)***
$EU_{ij,t}$	0.14 (0.05)***	0.25 (0.04)***	0.26 (0.04)***	0.11 (0.05)**	0.15 (0.06)**
$EU_{ij,t-5}$	0.15 (0.05)***	0.08 (0.05)*	0.07 (0.05)	0.07 (0.14)	0.02 (0.11)
$WTO_{ij,t}$	-0.37 (0.14)**	-0.28 (0.15)*	-0.30 (0.14)**	-0.36 (0.17)**	-0.27 (0.17)
$COMCUR_{ij,t}$	0.20 (0.05)***	-0.06 (0.03)*	-0.05 (0.03)	0.13 (0.05)***	-0.07 (0.04)*
$LNMIGR_{ij,t}$	0.22 (0.04)***	0.06 (0.03)**	0.04 (0.03)	0.22 (0.05)***	0.07 (0.03)*
$INTER_{ij,2001}$		0.31 (0.03)***	0.30 (0.04)***		0.32 (0.05)***
$INTER_{ij,2006}$		0.38 (0.03)***	0.37 (0.03)***		0.39 (0.03)***
$INTER_{ij,2011}$		0.47 (0.03)***	0.46 (0.03)***		
$EASTWEST_{ij,2001}$			0.14 (0.06)**		0.12 (0.06)**
$EASTWEST_{ij,2006}$			0.11 (0.07)		0.14 (0.08)*
$EASTWEST_{ij,2011}$			0.14 (0.08)*		
Observations	4,096	4,096	4,096	3,069	3,069

Results for importer-time, exporter-time and asymmetric country-pair fixed effects are excluded for brevity. Robust standard errors, clustered by country pair, are in parentheses. * $p < 0.10$, ** $p < .05$, *** $p < .01$

Table 3: Average partial effect of CSL

period of my sample, which explains the lower result in the coefficients of EU , since in 2006, Bulgaria and Romania did not join the European Union yet. In column (4), where the lead is added to the regression from column (1), $CSL_{ij,t+5}$ is positive and highly significant. Future language skills are correlated with contemporaneous trade and the large effect of common spoken language estimated in (1) is therefore not strictly exogenous. I test CSL from the regression from column (3) for strict exogeneity in column (5). Here, the 'feedback test' confirms that the modest and less significant effect of common spoken language is strictly exogenous. However, the effect of CSL is not significant anymore, likely due to the lower number of observations, and only marginally significant in column (3). In conclusion, a change in common spoken language is correlated with changes in bilateral trade, but only has a dubious causal effect.

A robustness check where I exclude North America from the regression, reported in column (1) of table B.1 in appendix B, raises further doubts on an exogenous effect of CSL on trade. I re-estimate column (3) and find no significant effect of common spoken language on trade. In the next section, I do not aggregate all languages into one variable but distinguish between the main languages in the sample, which all show different trends, as demonstrated in section 4.

5.2.2 Separate Languages

Dependent variable: $X_{ij,t}$	(1)	(2)	(3)	(4)
$CSL_ENGLISH_{ij,t}$	2.45 (0.69)***	0.88 (0.39)**	0.94 (0.39)**	0.95 (0.43)**
$CSL_GERMAN_{ij,t}$	-1.86 (0.70)***	-0.41 (0.43)		
$CSL_FRENCH_{ij,t}$	0.21 (0.63)	0.27 (0.35)		
$CSL_RUSSIAN_{ij,t}$	-1.88 (1.07)*	-0.36 (0.75)		
$CSL_OTHER_{ij,t}$	1.39 (0.58)**	0.39 (0.45)		
$CSL_NO_ENGLISH_{ij,t}$			0.37 (0.23)	0.35 (0.28)
$CSL_ENGLISH_{ij,t+5}$				1.24 (0.51)**
$RTA_{ij,t}$	0.72 (0.11)***	0.60 (0.10)***	0.60 (0.10)***	0.46 (0.09)***
$RTA_{ij,t-5}$	0.49 (0.04)***	0.18 (0.06)***	0.19 (0.06)***	0.18 (0.06)***
$EU_{ij,t}$	0.22 (0.05)***	0.26 (0.04)***	0.26 (0.04)***	0.15 (0.06)**
$EU_{ij,t-5}$	0.13 (0.05)***	0.08 (0.04)*	0.08 (0.04)*	0.05 (0.09)
$WTO_{ij,t}$	-0.30 (0.15)**	-0.29 (0.14)**	-0.31 (0.14)**	-0.30 (0.17)*
$COMCUR_{ij,t}$	0.25 (0.05)***	-0.04 (0.03)	-0.03 (0.03)	-0.04 (0.04)
$LNMIGR_{ij,t}$	0.24 (0.05)***	0.04 (0.03)	0.04 (0.03)	0.06 (0.03)*
<i>INTER-</i> and <i>EASTWEST-</i> trend	No	Yes	Yes	Yes
Observations	4,096	4,096	4,096	3,069

Results for importer-time, exporter-time and asymmetric country-pair fixed effects, as well as globalization and East-West trend, are excluded for brevity. Robust standard errors, clustered by country pair, are in parentheses. * $p < 0.10$, ** $p < .05$, *** $p < .01$

Table 4: Average partial effect by language, particularly English

A change in overall *CSL* in table 3 might not be detailed enough. The changes in each language sometimes offset each other. E.g., the increase in English speakers in the Czech Republic increased *CSL* for the country pair Czechia-Germany, but the simultaneous decrease in German skills reduces *CSL* for the same country pair. Overall, the variable neither measure the increase in common spoken English nor the decrease in common spoken German correctly. Therefore, I estimate the impact of a change in the four most widely spoken languages, English, German, French and Russian, separately.

I split up *CSL* by language into *CSL_ENGLISH*, *CSL_RUSSIAN*, *CSL_GERMAN* and *CSL_FRENCH* in column (1) and (2) in table 4. The remaining languages are subsumed in *CSL_OTHER*. In column (1), I do not include the *INTER-* or *EASTWEST-*trend. Out of the four main languages, only English has an positive and significant effect. An increase in German and Russian is even associated with less trade. In column (2), I control for a general globalization trend and an East-West trend, but omit the output in the table. The language variables' coefficients have the same sign as in column (1), however, only the effect of English

is still significantly different from zero.

What is there to learn from this results? Knowledge of Russian and German decreased in Eastern Europe, when at the same time international trade rose within the region and with Central European, German speaking countries. This results in a negative correlation between the change in both languages and trade, which turns insignificant once I control for a general rise in trade integration. The decrease in Russian and German skills also did not lead to reduced trade flows, which would have been indicated by positive coefficients.⁸ Partly, Russian and German was replaced as international language by English, especially in the New Member States of the European Union in Eastern and Southeastern Europe. This explains why the impact of *CSL_ENGLISH* is larger than that of aggregate *CSL* in table 3.

Since the impact of *CSL* on trade seems to be driven by English skills and the reduction in common German and Russian knowledge did not lead to a significant reduction in trade, I focus on English in the further analysis. In column (3), I distinguish between English and non-English languages, i.e. all other languages, including German, Russian and French. The impact of *CSL_ENGLISH* is again significant at the 5 percent level. An increase of ten percentage points in *CSL_ENGLISH* is correlated with an increase in international trade of $(\exp(0.94) - 1) \times 10 = 15.6$ percent.

In column (4), however, *CSL_ENGLISH* fails the feedback test. The effect of English is not strictly exogenous, even though I control for a globalization trend. In a robustness test I exclude North America. Table B.1 in appendix B displays the results. There, the feedback test confirms strict exogeneity since the effect of $CSL_ENGLISH_{t+5}$ is insignificant, but the coefficient is still positive and large. In conclusion, the results on an exogenous effect of changing language skills on trade are still ambiguous.

5.2.3 Non-constant Effect of Language on Trade

Translation complicates the impact of a common spoken language for two trading partners. Already a small number of bilinguals could be sufficient to distribute information between both countries (Melitz, 2008). Additionally, low values of common spoken language could indicate that countries are still in the contact phase of trade and common language is a more important trade restriction (Rauch, 1999). This might be particularly relevant for English in the Former Eastern Bloc, since it is a relatively new foreign language in these countries that enables trade with new trading partners in the West.

The same increase in common spoken language has a larger impact for a lower level of percentage of speakers than for a higher one, i.e. a decreasing marginal effect of language on trade can be observed. E.g., an increase of *CSL_ENGLISH* from 15 percent to 25 percent should have a larger effect on bilateral trade than a change from 55 percent to 65 percent.

To test this hypothesis, I split *CSL_ENGLISH* in the following five intervals that represents the distribution of the non-negative observations of the variable: [1,.5], [.5,.25], [.25,.125], [.125,.0625] and [.0625,0]. The results in column (1) in table 5 confirm the hypothesis. For the

⁸Importantly, this does not mean that, e.g., the common Russian language does not coincide with more trade within the former Eastern Bloc. This on average stronger trade is accounted for by the constant country-pair effects.

lowest interval, the trade volume effect of an increase in common spoken English, $\exp(3.1) - 1 = 21.2$, is a multiple of the highest interval, $\exp(1.5) - 1 = 3.5$. The coefficients of all intervals are highly significant and in general larger than the estimate of a constant language semi-elasticity. In conclusion, countries with a low percentage of English speakers, such as Central Eastern and Eastern European countries, profited most from an increase in English. All intervals pass the feedback test in column (2). The interval specification therefore describes a strictly exogenous effect. Thus, the reason for the endogeneity in 4 might be a model mis-specification, assuming a constant effect of *CSL_ENGLISH*.

Dependent variable: $X_{ij,t}$	(1)	(2)	(3)
<i>CSL_ENGLISH</i> _{<i>ij,t</i>}			
]0,0.0625]	3.10 (0.79)***	2.02 (0.83)**	3.04 (0.88)***
]0.0625,0.125]	2.55 (0.59)***	2.02 (0.57)***	2.58 (0.62)***
]0.125,0.25]	2.09 (0.53)***	1.69 (0.52)***	2.04 (0.55)***
]0.25,0.5]	1.69 (0.48)***	1.39 (0.48)***	1.59 (0.51)***
]0.5,1]	1.50 (0.45)***	1.29 (0.45)***	1.41 (0.47)***
<i>CSL_NO_ENGLISH</i> _{<i>ij,t</i>}	0.22 (0.22)	0.30 (0.28)	0.22 (0.25)
<i>CSL_ENGLISH</i> _{<i>ij,t+5</i>}			
]0,0.0625]		-1.26 (0.96)	
]0.0625,0.125]		-0.18 (0.69)	
]0.125,0.25]		0.25 (0.65)	
]0.25,0.5]		0.20 (0.64)	
]0.5,1]		0.31 (0.59)	
<i>EASTWEST</i> × <i>CSL_ENGLISH</i> _{<i>ij,t</i>}			
]0,0.0625]			-0.33 (1.83)
]0.0625,0.125]			-0.75 (1.28)
]0.125,0.25]			-0.32 (0.91)
]0.25,0.5]			0.30 (0.76)
<i>EASTWEST</i> × <i>CSL_NO_ENGLISH</i> _{<i>ij,t</i>}			-0.10 (0.46)
<i>RTA</i> _{<i>ij,t</i>}	0.60 (0.10)***	0.49 (0.09)***	0.59 (0.11)***
<i>RTA</i> _{<i>ij,t-5</i>}	0.19 (0.06)***	0.16 (0.06)**	0.20 (0.06)***
<i>EU</i> _{<i>ij,t</i>}	0.25 (0.04)***	0.16 (0.06)**	0.26 (0.04)***
<i>EU</i> _{<i>ij,t-5</i>}	0.08 (0.04)*	0.04 (0.09)	0.08 (0.04)*
<i>WTO</i> _{<i>ij,t</i>}	-0.30 (0.14)**	-0.26 (0.17)	-0.35 (0.14)**
<i>COMCUR</i> _{<i>ij,t</i>}	-0.04 (0.03)	-0.04 (0.04)	-0.04 (0.03)
<i>LN Migr</i> _{<i>ij,t</i>}	0.05 (0.03)*	0.08 (0.03)**	0.05 (0.03)
Observations	4,096	3,069	4,096

Results for importer-time, exporter-time and asymmetric country-pair fixed effects, as well as globalization and East-West trend, are excluded for brevity. Robust standard errors, clustered by country pair, are in parentheses. * $p < 0.10$, ** $p < .05$, *** $p < .01$

Table 5: Average partial effect of English intervals

To make the coefficients more readily interpretable, they can be translated to tariff equivalent effects, using the properties of the structural gravity equation. All that is needed is an reliable estimate of the trade elasticity of substitution, dubbed σ in section 2. The estimates range between 3 and 7, where I take the the preferred value of Head and Mayer (2014), $\sigma = 5$. Then, an increase in common spoken English from 15 percent to 25 percent is equivalent to a fall in *ad valorem* tariffs of $(\exp(2.09/5) - 1) \times 10 = 5.2$ percent.

In table 5, column (3), I include an interaction between *EASTWEST* and the English language intervals. For trade between East and West, there is no country pair with *CSL_ENGLISH* in the last interval, which is why no effect can be estimated. The impact of *CSL_ENGLISH*

is lower than for other trade, except for the third interval, but not significantly so. This reassures that the country pair fixed effects reliably control for any constant trade costs and the East-West-trend sufficiently controls for the trade integration of the former Eastern Bloc.

The results presented in this section might be driven by the largest country in the sample that is moreover an English speaking country, i.e. the United States. In a robustness check, I re-estimate the regressions from table 5 in table B.2 in appendix B without the North American countries U.S. and Canada. The robustness test confirms the results for a non-constant effect of language. Therefore, I choose the robust specification in column (1) in table 5 to estimate general equilibrium effects in the next section.

5.3 General Equilibrium Trade and Welfare Effects

In this section, I compute the trade and welfare effects of the increase in English speakers in the sample. The counterfactual is that English skills did not change in any of the countries. I use the estimated partial effects for the *CSL_ENGLISH* intervals from table 5, column (1). The effects therefore rely on the respective starting point in terms of English knowledge in the country. I put the results in comparison to the Enlargement of the European Union in 2004 and 2007.

I use a simple general equilibrium model from Baier et al. (2019), described in section 2. As in the previous section, I assume that $\sigma = 5$. The base year for the counterfactual is 1996, before the observed changes in language skills took place.

The change in *CSL_ENGLISH* between the base year 1996 and 2011 depends on the respective changes in exporter and importer country, reported in figure 1, and thus varies by country pair. The largest change in the probability that two randomly chosen people from two countries speak English is 23.6 for the pair Netherlands-Sweden, while the lowest changes, which are less than one percent, take place for trade with the Russian Federation.

Additionally, the partial effect of *CSL_ENGLISH* in my specification depends on the respective level of *CSL_ENGLISH* for each country pair. Since the effect diminishes with the level of *CSL_ENGLISH*, country pairs with already large percentage of English speakers are relatively less affected. As a result, the lowest change in trade barriers is assigned to the pair UK-Ireland, where English as a native language was already spoken by more than 90 percent of the population. The effect is a bit larger for the pairs including Russia, since less than 6 percent of the Russians spoke English, according to my data. With a value of more than .43, the highest changes in trade barriers took place for both Lithuania and Latvia with the Netherlands and Sweden, due to the low level of English speakers in the former countries in 1996 and the large increase in speakers in all four states.

Table 6 reports the estimated general equilibrium effects by country of the increase in English skills for total exports, total imports and welfare and compares them to the respective predictions for the effects of the EU Enlargement to the East in the 2000's. For the estimates for *CSL_ENGLISH*, I also report the bootstrapped standard errors in parenthesis.

It can be seen that all countries profit from the increase in English skills, except for Russia, where there is no significant impact on trade and welfare. The region that profited the most are the Baltic states, which started from a low level of English knowledge which increased strongly,

Country	change in CSL English			EU enlargement		
	$\Delta\%$ Exports	$\Delta\%$ Imports	$\Delta\%$ Welfare	Exports	Imports	Welfare
ARM	7.04 (6.37, 7.71)	1.37 (1.03, 1.70)	0.64 (0.30, 0.99)	-0.96	-0.19	-0.05
AUT	15.99 (11.78, 20.20)	13.40 (7.21, 19.58)	2.67 (0.91, 4.44)	7.12	5.97	1.12
BGR	7.68 (5.70, 9.67)	8.88 (7.31, 10.46)	1.36 (0.60, 2.12)	13.57	15.69	2.39
BLX	7.33 (4.80, 9.85)	8.02 (4.34, 11.69)	3.32 (1.20, 5.44)	0.26	0.29	0.13
CAN	4.26 (2.35, 6.17)	5.26 (1.70, 8.81)	0.59 (0.17, 1.01)	-0.11	-0.13	-0.01
CYP	12.37 (9.09, 15.65)	3.28 (1.73, 4.83)	2.02 (0.73, 3.31)	24.67	6.55	3.42
CZE	11.86 (10.25, 13.47)	10.00 (7.69, 12.31)	1.64 (0.75, 2.54)	24.80	20.92	3.50
DEU	16.02 (10.43, 21.61)	19.09 (10.90, 27.28)	1.38 (0.48, 2.29)	2.32	2.77	0.20
DNK	16.43 (8.53, 24.33)	15.32 (6.59, 24.06)	2.93 (0.81, 5.04)	1.73	1.61	0.29
ESP	6.57 (4.43, 8.71)	5.51 (3.88, 7.14)	0.43 (0.20, 0.65)	0.48	0.40	0.03
EST	14.64 (11.91, 17.37)	9.08 (7.74, 10.42)	4.06 (1.62, 6.49)	17.44	10.81	4.85
FIN	15.83 (7.76, 23.90)	21.67 (12.76, 30.58)	2.49 (0.75, 4.24)	4.88	6.68	0.74
FRA	6.48 (3.75, 9.21)	6.14 (4.15, 8.13)	0.46 (0.19, 0.73)	0.64	0.61	0.05
GBR	10.20 (4.10, 16.30)	8.83 (4.71, 12.95)	0.76 (0.22, 1.30)	0.80	0.69	0.06
GRC	24.60 (14.85, 34.36)	9.38 (5.51, 13.25)	2.00 (0.76, 3.23)	2.41	0.92	0.17
HUN	9.35 (8.24, 10.46)	7.61 (6.29, 8.94)	2.44 (1.05, 3.84)	19.58	15.94	5.28
IRL	3.11 (1.47, 4.76)	4.30 (2.45, 6.15)	0.99 (0.28, 1.70)	0.18	0.25	0.06
ITA	6.43 (3.25, 9.61)	8.31 (5.93, 10.69)	0.41 (0.19, 0.63)	1.36	1.76	0.09
KAZ	1.95 (1.09, 2.81)	1.33 (0.15, 2.51)	0.46 (0.16, 0.76)	-0.41	-0.28	-0.03
LTU	10.95 (8.90, 13.00)	8.32 (6.56, 10.09)	5.52 (2.38, 8.65)	11.43	8.69	5.69
LVA	15.66 (13.40, 17.91)	8.77 (6.86, 10.69)	4.70 (1.87, 7.52)	14.80	8.29	4.28
MLT	8.56 (5.22, 11.91)	4.46 (2.83, 6.09)	2.58 (0.81, 4.36)	19.37	10.09	6.16
NLD	10.98 (5.11, 16.84)	11.12 (5.99, 16.25)	4.64 (1.31, 7.97)	0.41	0.41	0.18
POL	24.65 (21.46, 27.84)	16.95 (13.30, 20.60)	1.65 (0.72, 2.58)	32.37	22.26	2.16
PRT	8.08 (5.15, 11.00)	6.17 (4.22, 8.12)	0.67 (0.31, 1.03)	0.20	0.16	0.02
ROU	12.44 (10.44, 14.45)	10.16 (8.50, 11.81)	0.68 (0.31, 1.05)	22.43	18.31	1.20
RUS	-0.41 (-1.44, 0.62)	-0.29 (-1.24, 0.67)	0.03 (-0.06, 0.12)	-2.14	-1.49	-0.07
SVK	8.83 (7.55, 10.11)	7.67 (5.71, 9.63)	2.61 (1.16, 4.06)	17.54	15.24	5.34
SVN	16.51 (8.31, 24.71)	14.42 (7.84, 21.00)	2.06 (0.75, 3.37)	26.43	23.09	3.40
SWE	17.88 (10.28, 25.49)	21.19 (9.75, 32.64)	2.90 (0.77, 5.04)	5.29	6.27	0.82
TUR	12.68 (10.68, 14.68)	6.92 (5.19, 8.64)	0.62 (0.29, 0.96)	-0.97	-0.53	-0.02
USA	9.50 (4.90, 14.11)	8.25 (4.87, 11.62)	0.15 (0.04, 0.25)	-0.41	-0.35	0.00
EU-15	10.95 (6.44, 15.46)	11.18 (6.65, 15.71)	1.22 (0.41, 2.03)	1.59	1.66	0.16
EU-NMS	14.57 (12.46, 16.68)	11.41 (9.10, 13.72)	1.85 (0.79, 2.91)	23.80	18.27	3.08
non-EU	7.24 (4.37, 10.11)	6.67 (3.94, 9.40)	0.19 (0.05, 0.32)	-0.44	-0.40	-0.01
all countries	10.35 (6.44, 14.26)	10.35 (6.44, 14.26)	0.77 (0.26, 1.28)	2.12	2.12	0.17

The table reports the results from a general equilibrium simulation of the effects of the increase in English skills and compares them to the results of the effect of the EU enlargements in 2004 and 2007. For the former set of results, I include bootstrapped 95% confidence intervals (10000 replications) in parentheses.

Table 6: General equilibrium trade and welfare effects

as shown in figure 1, and the Netherlands. The latter did not only see a relatively strong rise in English speakers, the also had high initial trade shares with countries that increased English knowledge in the population. States with relatively low initial trade shares with these countries, such as the Romance countries Italy, France and Spain, were less affected although the increase in percentage of English speakers was similar to Germany, where welfare effects were more than three times larger.

The right panel of table 6 presents the welfare and trade effects from the EU Enlargement 2004 and 2007. For the Baltics, the effects of the increase of English skills in the sample are comparable to that of the EU accession. Exports increased by 10-17 percent, imports by 8-11 percent and welfare by 4-5.7 percent, assuming again a trade elasticity of 5. For the other New Member States, however, the impact of a change in English skills on trade and welfare was

clearly lower than the effect of the EU accession.

At the bottom of table 6, I present results for aggregates over countries. The trade and welfare effects are largest for the ten new member states of the European Union, and lowest for the non-EU countries. Overall, welfare increased by 0.77 percent for the whole sample. The welfare effect of the EU accession in the right panel is larger for the new member states, positive, but lower, for the old members and almost zero for non-EU countries. Changes in trade for non-EU countries are negative due to trade diversion. The welfare and trade effects for the whole sample are smaller, which can be attributed to the fact that English skills increased in almost all countries, but only ten out of 32 countries joined the EU between 1996 and 2011. The only country not gaining from the overall increase in English skills is Russia, where the percentage of English speakers was already low and did not increase over time. The impacts of rising language knowledge are therefore not only of significant magnitude, they can be more evenly distributed and less exclusive as preferential trade agreements too.

6 Re-Estimating Fidrmuc and Fidrmuc (2016) 'Natural Experiment'

So far, I have investigated the effect of a change in common spoken language on trade in Europe and found that the magnitude of this impact depends on the initial level of common spoken language. However, it is not clear if the differences in levels themselves influence trade in this sample, since their effect was captured by country-pair fixed effects.

East-West trade is especially interesting in this respect, since different language policies were in place for more than five decades in Western and Eastern countries and at the same time, there was almost no trade across the Iron Curtain. It is therefore a suitable environment to estimate the causal effect of common spoken language on trade. Hence, I recapitulate the investigation of the effect of language on trade in the 'quasi-natural experiment' of the East-West divide carried out by Fidrmuc and Fidrmuc (2016). However, there are two main differences to their approach. First, while they use language and trade data from 2005, which is enough time after the Fall of the Iron Curtain to learn a foreign language for a larger part of the population, I use data from the mid and late 1990s. As seen in section 4, language skills changed noticeably between these two points in time. Second, I use the most recent estimation methods for the gravity model, the two-step CANOVA approach by Egger and Nigai (2015). The thus obtained results most likely differ from the OLS results estimated by Fidrmuc and Fidrmuc.

I use consecutive trade data from 1995 to 1999 and language data from the mid-1990s for 37 countries. As mentioned in section 3, the *Central and Eastern Eurobarometer* surveys conducted in the 1990s also contain language data for some additional countries that could not be used in section 5. The wider sample now includes Albania, North Macedonia, Norway, Serbia and Montenegro and Ukraine. Former Yugoslavia left the Warsaw Pact already in 1948 and Albania later in 1968, but both countries remained communist dictatorships. In the following, I count Albania and the successors of Yugoslavia as Eastern countries.

I use consecutive years for two reasons. First, it is better suited than using a single year since trade data is quite volatile. Second, language data is conducted in different years for

Eastern and Western countries.

$$\hat{\delta}_{ij} = \exp(\nu_i + \zeta_j + \beta_{CSL1}CSL_{ij,EASTWEST=1} + \beta_{CSL2}CSL_{ij,EASTWEST=0}) \times (\beta_{EW}EASTWEST_{ij} + \beta_k K_{ij} + \epsilon_{ij}) \quad (9)$$

In the first step, I decompose trade by exporter-time, importer-time and constant, asymmetric country-pair fixed effects. The model for the second step is described in equation 9. I regress the country-pair fixed effects from the first step, $\hat{\delta}_{ij}$, on CSL_{ij} and a set of covariates, K_{ij} , and a set of importer and exporter fixed effects. I estimate the effect of common spoken language separately for East-West-trade and other trade. I include a dummy variable for East-West-trade too, to control for any special feature of trade between East and West, e.g. relatively under-developed trade networks. As in the previous chapters, I control for linguistic proximity, $LP0$, for geography using distance intervals and a contiguity dummy, $GATT/WTO$ membership, regional trade agreements, EU membership (for the West), a common legal origin, common religion and colonial past. Additionally, I include a dummy that equals one if a country-pair belonged to the same (colonial) empire between 1815 (after the Congress of Vienna) and 1945, $EMPIREBEFORE45$, to capture historical and cultural similarities between these countries that might induce higher levels of trade. This could be relevant for trade between the former hegemons Germany, Austria and Turkey and their former dependencies in Eastern and South Eastern Europe. Since migration can partly explain the relationship between language and trade (Melitz and Toubal, 2014) and in the first half of the 1990s, massive emigration from Eastern Europe to the West took place, I control for the stock of migrants in 1995 in one of the specifications.

Table 7 reports the estimation results. In column (1), a common spoken language has a significant impact on trade only for East-West-trade, and the coefficient is remarkably large. It suggests that a ten percentage points larger probability that a individual from a Western country meets someone in the Eastern partner country who speaks the same language is correlated with $(\exp(1.91) - 1) \times 10 = 57.5$ percent more trade between those countries relative to other East-West-country pairs. Trade between East and West, however, is generally lower, as indicated by the negative coefficient of $EASTWEST$. My other cultural variables, $LP0$ and $RELIG$, as well as $COMLEG$, all have a positive effect. Distance elasticity almost equals one, a surprisingly standard result. In the previous chapters, distance elasticity was generally lower. A common border has no significant impact on trade, as well as the membership in the European Union. The positive effect of $GATT/WTO$ and RTA is significant only in some regressions. The colonial variables are all significant and positive.

In column (2), I include migration as additional explanatory variable. The coefficients of most other variables decrease, while the stock of migrants has a highly significant impact on trade. The effect of a ten percentage point change in CSL for East-West trade now diminishes to 14.6 percent. Linguistic proximity, however, still has the same effect on trade as in column (1). The impact of empires before 1945 turns insignificant.

It might be the case that historical and cultural effects of former empires differ by empire.

	(1)	(2)	(3)	(4)
Dependent variable: $\exp(\hat{\delta}_{ij})$				
<i>CSL</i> if <i>EASTWEST</i> = 1	1.91 (0.46)***	0.90 (0.50)*	2.28 (0.43)***	1.31 (0.45)***
<i>CSL</i> if <i>EASTWEST</i> = 0	0.30 (0.20)	0.05 (0.23)	0.52 (0.15)***	0.29 (0.17)*
<i>EASTWEST</i>	-0.23 (0.10)**	-0.17 (0.10)*	-0.19 (0.09)**	-0.14 (0.09)
<i>LP0</i>	0.54 (0.18)***	0.54 (0.18)***	0.39 (0.18)**	0.42 (0.17)**
<i>LNDIST</i> [0, 625]	-0.96 (0.12)***	-0.85 (0.12)***	-0.92 (0.10)***	-0.80 (0.10)***
<i>LNDIST</i> [625, 1250]	-0.99 (0.11)***	-0.88 (0.11)***	-0.94 (0.09)***	-0.81 (0.09)***
<i>LNDIST</i> [1250, 2500]	-1.01 (0.10)***	-0.90 (0.10)***	-0.95 (0.08)***	-0.83 (0.09)***
<i>LNDIST</i> [2500, 5000]	-1.02 (0.10)***	-0.90 (0.10)***	-0.97 (0.08)***	-0.84 (0.08)***
<i>LNDIST</i> [5000, 10000]	-1.06 (0.09)***	-0.98 (0.09)***	-0.99 (0.07)***	-0.89 (0.08)***
<i>LNDIST</i> [10000, 20000]	-1.09 (0.09)***	-0.99 (0.09)***	-1.01 (0.08)***	-0.91 (0.08)***
<i>CONTIG</i>	-0.03 (0.08)	-0.07 (0.08)	0.02 (0.08)	-0.03 (0.07)
<i>GATT/WTO</i>	0.03 (0.20)	0.20 (0.19)	0.25 (0.21)	0.44 (0.19)**
<i>RTA</i>	0.15 (0.09)*	0.11 (0.09)	0.25 (0.09)***	0.21 (0.09)**
<i>EU</i>	0.00 (0.11)	-0.02 (0.11)	0.07 (0.11)	0.03 (0.11)
<i>COMLEG</i>	0.25 (0.06)***	0.19 (0.06)***	0.35 (0.06)***	0.29 (0.06)***
<i>RELIG</i>	0.40 (0.11)***	0.31 (0.12)***	0.16 (0.13)	0.05 (0.14)
<i>COLPOST45</i>	1.43 (0.24)***	1.04 (0.24)***		
<i>SIBPOST45</i>	1.44 (0.23)***	1.00 (0.22)***		
<i>EMPIREBEFORE45</i>	0.14 (0.06)**	0.09 (0.06)		
<i>LNMIGR</i>		0.12 (0.02)***		0.12 (0.02)***
<i>COLPOST45_SU</i>			0.32 (0.33)	-0.12 (0.30)
<i>COLPOST45_OTHER</i>			1.77 (0.20)***	1.38 (0.22)***
<i>SIBPOST45_SU</i>			0.83 (0.31)***	0.37 (0.28)
<i>SIBPOST45_OTHER</i>			2.38 (0.63)***	1.92 (0.47)***
<i>EMPIRE_AUSTRIA</i>			0.40 (0.10)***	0.33 (0.10)***
<i>EMPIRE_RUSSIA</i>			0.40 (0.14)***	0.31 (0.14)**
<i>EMPIRE_TURKEY</i>			0.83 (0.23)***	0.85 (0.21)***
<i>EMPIRE_OTHER</i>			-0.18 (0.08)**	-0.18 (0.08)**
Observations	1,326	1,326	1,326	1,326
Imputed R^2	0.904	0.909	0.925	0.929

Results for importer and exporter fixed effects are excluded for brevity. Robust standard errors, clustered by country pair, are in parentheses.

* $p < 0.10$, ** $p < .05$, *** $p < .01$

Table 7: Effect of language on trade in the late 1990s

Therefore, I estimate separate effects for the three largest of them in Mainland Europe: the Austrian-Hungarian Empire, the Ottoman Empire, and the Russian Empire. Furthermore, I distinguish between the Soviet Union and other colonial empires, such as the British Empire, after 1945. Head et al. (2010) show that colonial trade links weakened faster after a separation that was accompanied by conflicts, as it was the case for the Soviet Union.

Results are presented in column (3) and (4), where I control for total migration stock in the latter column. It can be seen that historical effects differ between empires. Because of a certain degree of multicollinearity, the interpretation of the effects is sometimes difficult. E.g., former Soviet states do not seem to trade more with its former hegemon Russia, but with each other. However, parts of the Russian Empire, which also includes the later Soviet Union, trade more with each other. For the former parts of the Austrian and Turkish Empire, however, the effects are more readily to interpret, since both dissolved in 1918 and there is no multicollinearity with *COLPOST45*. For both regressions, the impact of *CSL* on trade increases, both for East-West trade and other trade. The impact of *COLPOST45_OTHER* reflects colonial relations between the United Kingdom and Malta and Cyprus that seem to persist until today.

	(1)	(2)	(3)	(4)
Dependent variable: $\exp(\hat{\delta}_{ij})$				
for <i>EASTWEST</i> = 1				
<i>CSL_ENGLISH</i>	0.26 (0.90)	-0.90 (0.93)	0.31 (0.89)	-0.67 (0.90)
<i>CSL_GERMAN</i>	1.39 (0.63)**	1.15 (0.62)*	0.74 (0.60)	0.54 (0.58)
<i>CSL_FRENCH</i>	0.86 (1.91)	0.04 (1.97)	1.67 (1.62)	1.03 (1.59)
<i>CSL_RUSSIAN</i>	-1.12 (3.91)	-5.61 (3.68)	1.76 (4.32)	-2.60 (4.04)
<i>CSL_OTHER</i>	5.08 (1.96)***	3.35 (1.91)*	5.07 (1.61)***	3.57 (1.53)**
for <i>EASTWEST</i> = 0				
<i>CSL_ENGLISH</i>	0.18 (0.29)	0.00 (0.31)	0.11 (0.25)	-0.03 (0.27)
<i>CSL_GERMAN</i>	-0.34 (0.51)	-0.32 (0.50)	-0.43 (0.42)	-0.42 (0.42)
<i>CSL_FRENCH</i>	0.41 (0.33)	0.33 (0.32)	0.31 (0.30)	0.26 (0.30)
<i>CSL_RUSSIAN</i>	-0.96 (0.38)**	-1.41 (0.37)***	1.43 (0.68)**	0.80 (0.66)
<i>CSL_OTHER</i>	0.33 (0.24)	0.11 (0.25)	0.43 (0.18)**	0.23 (0.20)
Migration	no	yes	no	yes
Separate empires	no	no	yes	yes
Observations	1326	1326	1326	1326
Imputed R^2	0.912	0.918	0.931	0.934

Results for importer and exporter fixed effects, as well as for control variables, are excluded for brevity. Robust standard errors, clustered by country pair, are in parentheses.

* $p < 0.10$, ** $p < .05$, *** $p < .01$

Table 8: Effect of language on trade in the late 1990s, separate main languages

The impact of *CSL* probably differs by language, since each language has spread at different times and for different reasons. French was the world language in the 19th century, German spread over centuries through the German and Austrian expansions and migration movements to the East, and Russian via the expansion of the Russian Empire and, more recently, through the mandatory Russian language schooling in the Eastern Bloc. The rise of English in Western Europe took place in the 20th century.

Fidrmuc and Fidrmuc (2016) find significant effects for English and German in the 2000s. Both results are suspicious: German spread to the East for historical reasons and therefore, the correlation with trade might be a relic of these historical relations. Foreign English skills were lower in the 1990s than in the mid-2000s, as shown in section 4. Thus, the effect for both results might not be exogenous. To investigate effects of separate languages, I split up *CSL* into the four main European languages already used in 5 and a fifth category for all other languages. I re-estimate the four regressions from table 7, but only report the results for the *CSL* variables in table 8. In columns (1), all languages but Russian have a positive coefficient on East-West-trade, but only German and the cumulative other languages are significant. The impact of English turns negative if I control for a migration-trade-link in column (2) and the effects of *CSL_GERMAN* and *CSL_OTHER* are only marginally significant. *CSL_OTHER* subsumes many relevant language relations between East and West, such as foreign Finnish knowledge in Estonia, proficiency in Italian and Greek in Albania, or the native language of the Turkish minority in Bulgaria.⁹

If I use the more nuanced measures of historical relations in column (3), all coefficients for trade between East and West are positive, but only *CSL_OTHER* is significant. With Migration in column (4), the impact of English and Russian switch sign, but stay insignificant.

⁹Western populations, apart from groups of native speakers, have only low skills in languages from the Eastern Bloc, such as Russian or BCMS ('Serbo-Croatian').

In a robustness check in table B.3 in appendix B, I estimate the last regression for each of the four main languages separately, but for East-West-trade only the respective cumulative language variable has a significant impact. I conclude that no single language has a significant effect of its own, but the general knowledge of foreign languages increased trade between East and West, in line with the results from section ??.

I controlled for geographic, cultural and linguistic distance, historical relations and migration networks in a 'quasi-natural experiment' environment and therefore I am confident that the result from table 7, column (4), can be interpreted as causal. The relatively large effect of $\exp(1.31) - 1 = 2.7$ percent for a one percentage point higher *CSL* can be attributed to the low levels of *CSL* between Western and Eastern countries in the sample. *CSL* is smaller than 0.5 for all East-West country pairs in the 1990s.

For trade between Western countries, *CSL* has only a small effect on trade, and for the estimations in table 8, no single Western language impacts trade. Supposedly, communication barriers have been overcome in the West. However, cultural differences, reflected by *RELIG* and *LP0*, are still an obstacle to trade. For the Russian language, only spoken by larger fractions of the population in Eastern countries, the impact is ambiguous. In columns (1) and (2) of table 8, the negative effect of Russian most likely compensates for the too large estimate of the colonial relations in the former Soviet Union. Correcting for this with separate colonial variables in column (3), the coefficient turns positive, suggesting that Russian skills enhance trade in the former Eastern Bloc.

In a robustness test, I exclude North America, as in the robustness checks in section 5, and the West Balkan states. I exclude Former Yugoslavia and Albania since they left the Eastern Bloc and established trade relations with Western countries early, casting doubt on the exogeneity of language skills in these countries. Table B.4 in appendix B reports the estimation results for this smaller sample. Surprisingly, the impact of common spoken language even increases. Interestingly, French has now a positive and significant impact on East-West-trade. The main driver of this result has to be Romania, the only country with considerable French language skills in the East. German is still only significant for the less detailed historical controls and English stays insignificant in all estimations.

7 Conclusion

I used a unique data set on time-varying language skills in 32, mostly European countries, to investigate the impact of changing common spoken language on trade. The main source of the data are the *Eurobarometer* surveys from 1994 to 2012, complemented by other surveys and census data. The data documents a large increase in English skills in most countries in the sample, and also a decline in Russian knowledge in the former Eastern Bloc. The changes were driven by younger cohorts with different foreign language skills than the older ones. The plausible explanation are changes in language policy, which are exogenous to the individual and were often caused by political rather than economical decisions.

I estimated the impact of these changes in language skills on trade. I controlled for endogeneity by country-pair fixed effects, for a general increase in international trade relative

to domestic trade, and for a convergence between East and West. A rise in common spoken language is correlated with an increase in bilateral trade, which is mostly driven by the rise in English knowledge. On average, an increase of ten percentage points in the probability that two randomly chosen people from two countries speak English is correlated with an increase in trade of 15.6 percent. A robust causal effect cannot be found for a constant semi-elasticity of common spoken language on trade. However, I show the effect of a *change* in English diminishes with its *level*. E.g., the same increase in common spoken English is correlated with a larger increase in trade for the country pair Latvia-Sweden than for the pair Netherlands-Sweden, since the initial percentage of English speakers is lower in Latvia than in the Netherlands. The thus found effect is robust and presumably exogenous, since I controlled for various sources of endogeneity and it passes the feedback effect for strict exogeneity.

I used the general equilibrium properties of the structural gravity analysis and a simple model by Baier et al. (2019) to project the general equilibrium trade and welfare effects of the increase in English skills in the sample, using the previously estimated non-constant language semi-elasticity. According to the results, all countries except for Russia profited from the rise in the percentage of English speakers. For the Baltics, the welfare gains were comparable to those of the EU accession. Overall, welfare in the whole sample increased by 0.77 percent.

Additionally, I revisited the 'natural experiment' of the East-West divide in language schooling by Fidrmuc and Fidrmuc (2016). I found a large, positive and significant effect for trade between Western and Eastern countries for overall common spoken language, but not for any separate language. The difference to Fidrmuc and Fidrmuc's results can be explained by the different estimation method, accounting for historical legacies, and the earlier time period. In particular English skills were lower in the mid-1990s than in 2005.

Mutual increase in foreign language skills thus seem to be a successful strategy for internationalization. Because of data limitations, the evidence presented here is restricted to changes in Europe, where one foreign language, English, is clearly dominating. For future research, it would be interesting to look at other regions and other rising world languages, such as Spanish, Arabic and Chinese.

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Appendices

A Data Appendix

Albanian	Greek	Romani
Arabic	Hebrew	Romanian
Armenian	Hindi	Russian
Azerbaijani	Hungarian	Slovak
Bulgarian	Italian	Slovenian
Catalan	Japanese	Spanish
Chinese	Kazakh	Swedish
Czech	Korean	Tagalog
Danish	Latvian	Tamil
Dutch	Lithuanian	Tatar
English	Maltese	Turkish
Estonian	Norwegian	Ukrainian
Finnish	Polish	Uyghur
French	Portuguese	Uzbek
Georgian	Punjabi	Vietnamese
German	BCMS (Bosnian-Croatian-Montenegrin-Serbian)	

Languages spoken in only one country (e.g. Irish, Welsh) or by less than one percent of the population in more than one country (e.g. Afrikaans, Malay) are excluded. See text for further details.

Table A.1: Considered languages for *CSL*

(ALB*)	Albania	KAZ*	Kazakhstan
ARM*	Armenia	LTU*	Lithuania
AUT	Austria	LVA*	Latvia
BGR*	Bulgaria	(MKD*)	North Macedonia
BLX	Belgium-Luxembourg	MLT	Malta
CAN	Canada	NLD	The Netherlands
CYP	Republic of Cyprus	(NOR)	Norway
CZE*	Czech Republic	POL*	Poland
DEU	Germany	PRT	Portugal
DNK	Denmark	ROU*	Romania
ESP	Spain	RUS*	Russian Federation
EST*	Estonia	(SCG*)	Serbia and Montenegro
FIN	Finland	SVK*	Slovak Republic
FRA	France	SVN*	Slovenia
GBR	United Kingdom	SWE	Sweden
GRC	Greece	TUR	Turkey
HUN*	Hungary	(UKR*)	Ukraine
IRL	Ireland	USA	United States of America
ITA	Italy		

Countries that are specified as 'East' are indicated by an asterisk. Countries in parenthesis are used only in section 6. Figures 1 and 2 include Georgia and Croatia as well, which are excluded from the econometric analysis because of missing data on internal trade in the 1990s. See text for further details.

Table A.2: Country coverage and abbreviations

B Robustness Checks

I included Canada and the United States in the sample since both countries are important Western economies, trading partners, and destination countries of many emigrants from Eastern Europe. Yet there are reasons to exclude both countries. First, the U.S. are by far the largest single economy in the sample, thus representing a huge outlier. Second, both U.S.' and Canada's main language is English, which I focus on in the main part. Therefore it would be crucial to test if the results from chapter 5.2 also hold if I exclude the two North American states.

Column (1) in table B.1 reports the estimation with *CSL*, finding no significant impact for a change in overall common spoken language on trade. The results for separate languages in columns (2)-(4) confirm the corresponding estimates in table 4. Contrary to the results in the main text, *CSL_ENGLISH* passes the feedback test, although the coefficient of the lead variable is relatively large.

In table B.2, I re-estimate the regressions from table 5 without U.S. and Canada. All results are robust and the coefficients are almost the same. Again, the interactions between the *CSL_ENGLISH* intervals and *EASTWEST* are not significantly different from zero, but negative.

	(1)	(2)	(3)	(4)
Dependent variable: $X_{ij,t}$				
$CSL_{ij,t}$	0.32 (0.23)			
$CSL_ENGLISH_{ij,t}$		1.22 (0.45)***	1.16 (0.46)**	1.28 (0.52)**
$CSL_GERMAN_{ij,t}$		-0.27 (0.40)		
$CSL_FRENCH_{ij,t}$		0.44 (0.35)		
$CSL_RUSSIAN_{ij,t}$		-0.41 (0.79)		
$CSL_OTHER_{ij,t}$		0.13 (0.42)		
$CSL_NO_ENGLISH_{ij,t}$			0.35 (0.21)*	0.15 (0.26)
$CSL_ENGLISH_{ij,t+5}$				1.00 (0.62)
$RTA_{ij,t}$	0.60 (0.10)***	0.61 (0.11)***	0.61 (0.11)***	0.48 (0.09)***
$RTA_{ij,t-5}$	0.20 (0.06)***	0.19 (0.06)***	0.19 (0.06)***	0.20 (0.07)***
$EU_{ij,t}$	0.24 (0.04)***	0.24 (0.04)***	0.24 (0.04)***	0.13 (0.06)**
$EU_{ij,t-5}$	0.08 (0.05)*	0.09 (0.04)**	0.09 (0.04)**	0.08 (0.08)
$WTO_{ij,t}$	-0.36 (0.14)**	-0.37 (0.14)***	-0.37 (0.14)***	-0.35 (0.17)**
$COMCUR_{ij,t}$	-0.01 (0.04)	0.01 (0.03)	0.01 (0.03)	0.04 (0.04)
$LNMIGR_{ij,t}$	0.03 (0.03)	0.02 (0.03)	0.03 (0.03)	0.06 (0.03)*
$INTER_{ij,2001}$	0.22 (0.04)***	0.20 (0.04)***	0.22 (0.04)***	0.20 (0.04)***
$INTER_{ij,2006}$	0.33 (0.04)***	0.34 (0.03)***	0.34 (0.03)***	0.33 (0.03)***
$INTER_{ij,2011}$	0.45 (0.04)***	0.45 (0.04)***	0.46 (0.04)***	
$EASTWEST_{ij,2001}$	0.21 (0.06)***	0.24 (0.06)***	0.24 (0.06)***	0.25 (0.06)***
$EASTWEST_{ij,2006}$	0.17 (0.07)**	0.23 (0.07)***	0.21 (0.07)***	0.27 (0.07)***
$EASTWEST_{ij,2011}$	0.17 (0.08)**	0.21 (0.08)***	0.20 (0.08)***	
Observations	3,600	3,600	3,600	2,697

Results for importer-time, exporter-time and asymmetric country-pair fixed effects are excluded for brevity. Robust standard errors, clustered by country pair, are in parentheses.

* $p < 0.10$, ** $p < .05$, *** $p < .01$

Table B.1: Average partial effect of language, without U.S. and Canada

Dependent variable: $X_{ij,t}$	(1)	(2)	(3)
<i>CSL_ENGLISH</i> _{<i>ij,t</i>}			
]0,0.0625]	3.00 (0.81)***	2.67 (0.85)***	2.88 (0.90)***
]0.0625,0.125]	2.55 (0.63)***	2.69 (0.61)***	2.65 (0.66)***
]0.125,0.25]	2.23 (0.58)***	2.37 (0.57)***	2.34 (0.60)***
]0.25,0.5]	1.91 (0.55)***	2.14 (0.53)***	1.99 (0.57)***
]0.5,1]	1.71 (0.51)***	1.94 (0.51)***	1.79 (0.53)***
<i>CSL_NO_ENGLISH</i> _{<i>ij,t</i>}	0.21 (0.20)	-0.02 (0.26)	0.26 (0.24)
<i>CSL_ENGLISH</i> _{<i>ij,t+5</i>}			
]0,0.0625]		-1.16 (0.93)	
]0.0625,0.125]		-0.39 (0.71)	
]0.125,0.25]		-0.14 (0.71)	
]0.25,0.5]		-0.25 (0.71)	
]0.5,1]		-0.10 (0.66)	
<i>EASTWEST</i> × <i>CSL_ENGLISH</i> _{<i>ij,t</i>}			
]0,0.0625]			-0.16 (1.92)
]0.0625,0.125]			-1.05 (1.32)
]0.125,0.25]			-0.76 (0.92)
]0.25,0.5]			-0.41 (0.76)
<i>EASTWEST</i> × <i>CSL_NO_ENGLISH</i> _{<i>ij,t</i>}			-0.13 (0.48)
<i>RTA</i> _{<i>ij,t</i>}	0.61 (0.11)***	0.50 (0.09)***	0.58 (0.11)***
<i>RTA</i> _{<i>ij,t-5</i>}	0.19 (0.06)***	0.19 (0.07)***	0.21 (0.06)***
<i>EU</i> _{<i>ij,t</i>}	0.23 (0.04)***	0.14 (0.06)**	0.24 (0.04)***
<i>EU</i> _{<i>ij,t-5</i>}	0.09 (0.04)**	0.09 (0.08)	0.09 (0.04)**
<i>WTO</i> _{<i>ij,t</i>}	-0.38 (0.14)***	-0.32 (0.17)*	-0.38 (0.14)***
<i>COMCUR</i> _{<i>ij,t</i>}	0.00 (0.03)	0.04 (0.04)	0.00 (0.03)
<i>LN Migr</i> _{<i>ij,t</i>}	0.04 (0.03)	0.08 (0.03)**	0.03 (0.03)
Observations	3,600	2,697	3,600

Results for importer-time, exporter-time and asymmetric country-pair fixed effects, as well as globalization and East-West trend, are excluded for brevity. Robust standard errors, clustered by country pair, are in parentheses.

* $p < 0.10$, ** $p < .05$, *** $p < .01$

Table B.2: Average partial effect of English intervals, without U.S. and Canada

	(1)	(2)	(3)	(4)	(5)
Dependent variable: $\exp(\hat{\delta}_{ij})$					
for <i>EASTWEST</i> = 1					
<i>CSL_ENGLISH</i>	-0.69 (0.88)				
<i>CSL_NO_ENGLISH</i>	1.73 (0.49)***				
<i>CSL_GERMAN</i>		0.22 (0.57)			
<i>CSL_NO_GERMAN</i>		1.56 (0.64)**			
<i>CSL_FRENCH</i>			1.20 (1.68)		
<i>CSL_NO_FRENCH</i>			1.27 (0.45)***		
<i>CSL_RUSSIAN</i>				-0.88 (4.09)	
<i>CSL_NO_RUSSIAN</i>				1.25 (0.48)***	
<i>CSL_MAIN</i>					0.62 (0.49)
<i>CSL_NO_MAIN</i>					3.61 (1.49)**
for <i>EASTWEST</i> = 0					
<i>CSL_ENGLISH</i>	0.02 (0.27)				
<i>CSL_NO_ENGLISH</i>	0.16 (0.17)				
<i>CSL_GERMAN</i>		-0.37 (0.42)			
<i>CSL_NO_GERMAN</i>		0.36 (0.16)**			
<i>CSL_FRENCH</i>			0.31 (0.29)		
<i>CSL_NO_FRENCH</i>			0.26 (0.18)		
<i>CSL_RUSSIAN</i>				0.96 (0.66)	
<i>CSL_NO_RUSSIAN</i>				0.26 (0.18)	
<i>CSL_MAIN</i>					0.05 (0.21)
<i>CSL_NO_MAIN</i>					0.21 (0.19)
<i>LPO</i>	0.40 (0.18)**	0.44 (0.19)**	0.43 (0.18)**	0.39 (0.17)**	0.35 (0.17)**
Observations	1,326	1,326	1,326	1,326	1,326
Imputed R^2	0.929	0.932	0.929	0.929	0.931

Results for importer and exporter fixed effects, as well as for control variables, are excluded for brevity. Robust standard errors, clustered by country pair, are in parentheses.

* $p < 0.10$, ** $p < .05$, *** $p < .01$

Table B.3: Effect of language on trade in the late 1990s, separate main languages

	(1)	(2)	(3)	(4)				
Dependent variable: $\exp(\hat{\delta}_{ij})$								
<i>CSL</i> if <i>EASTWEST</i> = 1	2.89	(0.74)***	1.66	(0.77)**	3.38	(0.69)***	2.24	(0.71)***
<i>CSL</i> if <i>EASTWEST</i> = 0	0.46	(0.31)	0.18	(0.32)	0.67	(0.25)***	0.42	(0.25)*
<i>EASTWEST</i>	-0.24	(0.11)**	-0.14	(0.11)	-0.19	(0.10)*	-0.10	(0.11)
<i>LP0</i>	0.52	(0.18)***	0.56	(0.18)***	0.28	(0.18)	0.34	(0.19)*
<i>LNDIST</i> [0, 625]	-0.83	(0.11)***	-0.76	(0.10)***	-0.83	(0.10)***	-0.77	(0.10)***
<i>LNDIST</i> [625, 1250]	-0.86	(0.10)***	-0.78	(0.09)***	-0.84	(0.09)***	-0.77	(0.09)***
<i>LNDIST</i> [1250, 2500]	-0.89	(0.09)***	-0.81	(0.09)***	-0.87	(0.08)***	-0.80	(0.08)***
<i>LNDIST</i> [2500, 5000]	-0.90	(0.09)***	-0.81	(0.09)***	-0.89	(0.08)***	-0.81	(0.08)***
<i>LNDIST</i> [5000, 10000]	-0.97	(0.09)***	-0.86	(0.09)***	-0.95	(0.09)***	-0.85	(0.09)***
<i>CONTIG</i>	0.00	(0.08)	-0.02	(0.08)	0.03	(0.08)	0.00	(0.07)
<i>GATT/WTO</i>	-0.53	(0.36)	-0.34	(0.35)	0.43	(0.32)	0.57	(0.32)*
<i>RTA</i>	0.26	(0.10)***	0.24	(0.10)**	0.35	(0.10)***	0.33	(0.10)***
<i>EU</i>	0.29	(0.16)*	0.28	(0.15)*	0.40	(0.15)***	0.38	(0.15)**
<i>COMLEG</i>	0.24	(0.08)***	0.18	(0.07)**	0.28	(0.07)***	0.22	(0.07)***
<i>COLPOST45</i>	1.44	(0.32)***	0.97	(0.31)***				
<i>SIBPOST45</i>	1.68	(0.34)***	1.20	(0.34)***				
<i>RELIG</i>	0.35	(0.12)***	0.20	(0.13)	0.29	(0.12)**	0.15	(0.13)
<i>EMPIREBEFORE45</i>	0.12	(0.06)*	0.05	(0.07)				
<i>LNMIGR</i>			0.13	(0.02)***			0.11	(0.02)***
<i>COLPOST45_OTHER</i>					1.75	(0.28)***	1.32	(0.28)***
<i>COLPOST45_SU</i>					-0.22	(0.42)	-0.55	(0.43)
<i>SIBPOST45_SU</i>					0.50	(0.39)	0.12	(0.40)
<i>SIBPOST45_OTHER</i>					-0.05	(0.35)	-0.12	(0.35)
<i>EMPIRE_AUSTRIA</i>					0.50	(0.12)***	0.40	(0.12)***
<i>EMPIRE_RUSSIA</i>					0.36	(0.14)**	0.26	(0.14)*
<i>EMPIRE_TURKEY</i>					0.34	(0.21)	0.33	(0.21)
<i>EMPIRE_OTHER</i>					-0.13	(0.09)	-0.17	(0.10)*
Observations	929		929		929		929	
Imputed R^2	0.928		0.929		0.940		0.939	

	(1)	(2)	(3)	(4)				
Dependent variable: $\exp(\hat{\delta}_{ij})$								
for <i>EASTWEST</i> = 1								
<i>CSL_ENGLISH</i>	1.02	(1.48)	-1.16	(1.53)	2.28	(1.46)	0.36	(1.53)
<i>CSL_GERMAN</i>	1.71	(0.76)**	1.60	(0.80)**	1.42	(0.74)*	1.29	(0.79)
<i>CSL_FRENCH</i>	2.64	(1.39)*	2.44	(1.36)*	2.76	(1.31)**	2.57	(1.27)**
<i>CSL_RUSSIAN</i>	-2.65	(4.22)	-7.21	(3.94)*	0.60	(4.63)	-3.29	(4.45)
<i>CSL_OTHER</i>	8.43	(1.76)***	6.00	(1.99)***	8.16	(1.81)***	6.19	(2.04)***
for <i>EASTWEST</i> = 0								
<i>CSL_ENGLISH</i>	-0.05	(0.32)	-0.33	(0.33)	0.16	(0.30)	-0.10	(0.32)
<i>CSL_GERMAN</i>	-0.27	(0.46)	-0.26	(0.48)	-0.21	(0.39)	-0.22	(0.42)
<i>CSL_FRENCH</i>	0.55	(0.29)*	0.50	(0.31)*	0.39	(0.28)	0.38	(0.29)
<i>CSL_RUSSIAN</i>	-0.84	(0.42)**	-1.15	(0.41)***	1.20	(0.65)*	0.81	(0.66)
<i>CSL_OTHER</i>	0.56	(0.34)*	0.28	(0.32)	0.62	(0.30)**	0.38	(0.30)
Migration	no		yes		no		yes	
Separate empires	no		no		yes		yes	
Observations	929		929		929		929	
Imputed R^2	0.937		0.937		0.945		0.945	

Results for importer and exporter fixed effects, as well as for control variables in the lower panel, are excluded for brevity. Robust standard errors, clustered by country pair, are in parentheses.

* $p < 0.10$, ** $p < .05$, *** $p < .01$

Table B.4: Effect of language on trade in the late 1990s, without West Balkans and North America