

Does Cultural Proximity and Bilateral Trust Affect International Trade and Migration?

THESIS

presented to the Faculty of Economics and Social Sciences
at the University of Fribourg (Switzerland)

by

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in fulfillment of the requirements for the degree of Doctor of
Economics and Social Sciences.

Accepted by the Faculty of Economics and Social Sciences
on 23.02.2015 at the proposal of
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Fribourg, Switzerland 2015

The Faculty of Economics and Social Sciences at the University of Fribourg neither approves nor disapproves the opinions expressed in a doctoral thesis. They are to be considered those of the author. (Decision of the Faculty Council of 23 January 1990.)

to my husband Stéphane and my children

to my grandmother Mimi Rose

Acknowledgements

I would like to express my gratitude to my supervisor Professor Dr Volker Grossmann for his continuing support and constructive comments. Working under his supervision has been an extraordinary experience thanks to his constant availability, guidance and our insightful discussions. I also thank my committee members, Professor Dr Thierry Madiès and Professor Dr Reiner Eichenberger for their useful comments and remarks.

I benefited from valuable comments and suggestions by numerous participants and discussants at workshops, Ph.D. seminars and international conferences. I particularly want to thank Professor Dr Joshua Angrist, Professor Dr Manuel Arellano, Professor Dr Josef Falkinger, Professor Dr Bo Honor, Professor Dr Mark Watson and Dr Aderonke Osikominu, as well as seminar participants at the Spring Meeting of Young Economists 2012, the Synergia workshop “Inequality and International Trade” 2012, the Annual Congress of the Swiss Society for Economics and Statistics (SSES) 2013, the Young Swiss Economist Meeting 2013, the Annual Meeting of the German Association of Economists (“Verein für Socialpolitik”) 2013 and the CESifo/ETH conference on “Estimation of Gravity Models of Bilateral Trade” 2014.

Many thanks to my colleagues and friends at the University of Fribourg and the University of Geneva for interesting discussions and pleasant moments. I am thinking of Estefania Amer, Julie Régolo, Marius Osterfeld, Anna Koukal, Anna Rohe, Ann Bauer, Tjasa Maillard-Bjedov, Michael Weber, Stephanie Fuerer, Dr Marco Portmann and David Stadelmann, among many others. Special thanks to Ruth Neuhaus and Denise Converso

who have always been there for help and assistance. I also want to take this opportunity to thank Patricia Lauper for her constant encouragements.

This research project would not have been possible without the support of my husband, Stéphane Raemy. I dedicate this thesis to him and to our wonderful children. I am also indebted to my grandmother, Mimi Rose Hayoz, who has been my pillar throughout my life. The enthusiasm and positive attitudes of my husband and my grandmother have enlightened my life and made it possible to realise my dream of writing a Ph.D. thesis. Thank you very much Chouchou, Lina and Grosmami.

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Acronyms

CCE	Common Correlated Effects
CUE	Continuously Updated GMM Estimator
DtS	Destination-to-Source
EU	European Union
GBMD	Global Bilateral Migration Database
GDP	Gross Domestic Product
GEV	Generalised Extreme Value
GPML	Gamma Pseudo Maximum Likelihood
GSZ	Guiso, Sapienza and Zingales (2009)
IIA	Independence from Irrelevant Alternative
K-P	Kleibergen-Paap
LIML	Limited Information Maximum Likelihood
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
PML	Pseudo Maximum Likelihood
PPML	Poisson Pseudo Maximum Likelihood
RUM	Random Utility Maximisation
StD	Source-to-Destination
WRD	World Religion Database
2SLS	Two-Stage Least-Squares

Chapter 1

Motivation and Overview

A growing literature suggests that national borders remain important despite policy change and transport improvements because they capture the effects of informal and cultural barriers that can affect international exchange considerably. This doctoral thesis attempts to advance this literature by addressing and answering three research questions that analyse whether cultural proximity and bilateral trust affects international trade and factor mobility. More precisely, it first analyses whether culturally rooted bilateral trust affect international trade or migration. Second, it examines whether this effect is particularly important for the location choices of potential female migrants. Finally, it analyses whether other cultural factors, such as religious similarity of country pairs, affect international migration flows.

The first question is addressed in Chapter 2. International trade is often characterised by asymmetric information that may lead to opportunistic behaviour. To prevent this type of behaviour, contracts define the obligations of all implied parties. However, contracts are by nature incomplete as it is too costly to take into account or even know all contingencies when establishing them. Furthermore, it can be difficult to negotiate, monitor and enforce contracts, especially in international trade where commercial partners are established in different jurisdictions. As a result, profitable trade opportunities might

not be realised, unless the parties trust each other. Similarly, trust may have an impact on the decision to migrate to a foreign country. In the absence of important barriers to migration, individuals only move to a foreign country if the expected migration benefits exceed the expected migration costs. However, forming such expectations is difficult, as would-be migrants are generally not fully aware of the social, political, institutional and cultural environments that prevail in host countries. In such a context, their decision to migrate may rely on the trust they have in the citizens of potential destination countries, which is referred to as “source-to-destination” (StD) trust, if it changes the way expectations about the costs and benefits of moving abroad are formed. Likewise, the trust that citizens from the destination country grant citizens from the source country, referred to as “destination-to-source” (DtS) trust, may play a role in the migration decision. For instance, it may affect immigration policies towards specific countries or regions.

The relationship between bilateral trust and trade has already been analysed by Guiso, Sapienza and Zingales (2009; henceforth GSZ). They estimate a gravity model of trade with an indicator of bilateral trust provided by the Eurobarometer surveys as a regressor in addition to the traditional determinants included in trade models. This indicator measures the trust that citizens of a country importing goods have in an average citizen of their partner country (DtS trust). As GSZ suspect this trust measure to be endogenous, they aim to isolate its exogenous variation with two indicators of the cultural proximity of country pairs, a measure of physical dissimilarities between the ‘representative’ individuals in two countries (called “somatic distance”) and a measure of religious similarity. Estimating the gravity model using an instrumental variables (IV) approach, they find coefficients that suggest DtS trust has a statistically and economically important causal effect on bilateral trade across countries. However, these IV estimates are more than five times larger than their insignificant ordinary least squares (OLS) counterparts, and GSZ acknowledge that religious similarity and somatic distance may affect international trade through cultural and institutional channels differently than bilateral trust. This

questions the validity of their identification strategy and therefore of their IV results. Nevertheless, they conclude that the positive and significant IV coefficient on DtS trust is evidence that cultural proximity is an important determinant of international trade, and this without performing further sensitivity analysis.

Chapter 2 aims to fill this gap first by attempting to replicate the results of GSZ and second by performing a thorough sensitivity analysis. To do this, religious similarity is not used as an instrumental variable for DtS trust because it is very likely to affect trade directly or through other channels other than bilateral trust. Instead, it is included in the trade equation at the second stage. The exogenous variation of DtS trust is captured with eight alternative indicators of somatic distance, exploiting the notion that individuals who look less alike tend to trust each other less. As all these indicators are equally valid and strong instruments, it should not matter for consistent second-stage estimates which one is chosen to instrument bilateral trust with. However, in the context of international trade, the coefficient on DtS trust is only significant when instrumented with the indicator employed by GSZ. Otherwise, that is, when using any other and equally valid somatic distance indicator as the instrument, this significance disappears and the magnitude of the coefficient on bilateral trust decreases and even becomes negative. A similar result is observed when estimating the reduced-form equation of the dependent variable where the endogenous trust variable is replaced by its instrument. When regressing international trade alternatively on the different measures of somatic distance in addition to the other control variables, the estimation only yields a significant coefficient on the somatic distance indicator used by GSZ. The absence of significant coefficients on all other indicators casts doubt on the existence of the relationship between bilateral trade and trust. Overall, the lack of the robustness of the IV results and the insignificant coefficients on somatic distance in the reduced-form equation contradict the conclusion made by GSZ. In other words, no significant relationship between bilateral trust and international trade is found when performing a thorough sensitivity analysis.

To analyse the relationship between bilateral trust and international migration in Chapter 2, a structural equation is derived from a random utility maximisation (RUM) model where individuals only migrate if the utility of moving abroad is greater than the utility of staying at home. Migrants are assumed to be systematically different from people staying at home, thereby accounting for heterogeneity within the source countries. This also relaxes the strong assumption of the independence of irrelevant alternatives that gives rise to proportional substitution patterns. The derived equation regresses international migration flows alternatively on StD and DtS trust in addition to traditional control variables such as geographic distance, common language and common colonial history. The OLS coefficients on StD and DtS trust are never statistically different from zero. Neither are the IV coefficients where bilateral trust is instrumented with the different measures of somatic distance. Moreover, somatic distance is never significantly different from zero in the reduced-form equation of international migration. In other words, there is no evidence that StD or DtS trust affect a potential migrants' location choices.

In Chapter 2, migration flows are not classified by gender. This is only appropriate if female and male migration patterns are equally affected by bilateral trust. Yet, this condition is not necessarily satisfied. On the contrary, the trust in citizens of potential destination countries might be particularly important for the location decisions of women while being negligible for those of men. This is because migration is a risky decision and it has been repeatedly shown in experimental economics that women tend to be more risk-averse than men. Moreover, women seem to suffer more stress when moving abroad than do men. The hypothesis is investigated in Chapter 3, where the theoretical model again allows migrants to systematically differ from individuals who decide to stay in their home country. The structural equation derived from this model now regresses female migration flows on StD trust in addition to traditional determinants of international migration. It is log-linearised and estimated using two-stage least-squares approaches in

order to address potential endogeneity biases. This linearisation, however, has two main drawbacks. First, taking the logarithm drops all observations that report zero migration, leading to a loss of information and, therefore, to potentially severe biases. Second, log-linearisation is only appropriate when the data used in the analysis is homoscedastic, a property that is rarely satisfied in data on international migration. Therefore, the structural equation is also estimated in its multiplicative form using a Poisson Pseudo Maximum Likelihood (PPML) approach, which yields consistent coefficients in the presence of heteroscedasticity and zero outcome observations. Finally, the coefficients on StD trust are estimated using an ordered logit model that allows the inclusion of observations reporting negative migration flows. The estimation results are not robust across the different estimation approaches. Overall, there is little evidence that bilateral trust matters in the location choices of female migrants. Regressing only male migration flows on StD trust does not yield significant coefficients on StD trust either. These results are consistent with the ones presented in Chapter 2 and therefore contribute to the robustness of the findings presented there.

Chapter 4 addresses the last question, that is, whether religious similarity of country pairs fosters international migration flows. These flows depend on many factors, such as the expected income in the host country or physical moving costs. In addition to such monetary factors, both the benefits and costs of international migration can be of a social or psychological nature. For instance, assimilation costs very much depend on how similar the linguistic and cultural backgrounds of the source and destination countries are. Speaking the host country's language and being familiar with its formal and informal behavioural rules should facilitate the integration process. To account for this, scholars generally verify whether two countries have the same official language, share a national border, have a common history and/or have a common institutional background. Additionally, religious similarity might foster international migration by promoting cultural proximity between country pairs. Religion shapes cultural traditions, influences prevail-

ing morals and values, and is often a central element in the formation of individual and social identities. Moving to a country with a familiar religious background might also mitigate migration costs by providing newcomers with religious networks that help them find housing and employment, or provide them with places where they can interact with people who are born or who have already settled in the destination country. Finally, religious networks provide newcomers with psychological and spiritual support. International migration is often described as a destabilising process that causes anxiety and feelings of intensified insecurity. In such situations, religious identification was shown to play a particularly important role in the well-being of immigrants. Yet, immigrant networks established in destination countries might also provide newcomers with such services. This could decrease the importance of being familiar with the religious background of the destination country for immigrants who have access to such networks. Equivalently, religious similarity might be particularly important for immigrants coming from new source countries who only have limited access to such a diaspora. Chapter 4 therefore not only analyses whether religious similarity between country pairs affects international migration but also investigates whether this effect depends on the size of immigrant communities existing in the destination country. To perform this analysis, the location choice problem is again derived from a RUM model where stayers are assumed to be different from migrants. Additionally, the theoretical model allows alternative destinations to be perceived as close substitutes by migrants. To tackle potential mis-specifications caused by heteroscedasticity, endogeneity and/or sample selection, the equation derived from the theoretical model is estimated using PPML, an IV version of PPML and an ordered logit model. These estimations all yield significantly positive coefficients on religious similarity. The Poisson estimates suggest that migration flows are 136 percent higher between countries sharing the majority religion than between countries with different religious backgrounds. As expected, the estimation results also find a significant coefficient on the interaction between religious similarity and diaspora, providing evidence in favour of the

hypothesis that religious similarity is particularly important for individuals moving to countries with only a few established compatriots.

Finally, Chapter 5 summarizes, outlines open questions and suggest further research possibilities.

Chapters 2 to 4 are all organised similarly. They are composed of an introduction, a summary of the related literature, a presentation of the model, the empirical strategy and the data, an outline of the results and a conclusion. Therefore, although they all build on each other, they can be read independently of one another. The research paper forming the basis of Chapter 2 was published in the journal *Empirical Economics* in February 2015. The other research papers forming this thesis have been discussed and presented at scientific conferences.

Chapter 2

Does Bilateral Trust Really Affect International Trade and Factor Mobility?

2.1 Introduction

The role of cultural proximity and trust in economic exchange is a long-standing issue that has attracted renewed interest in the more recent literature. For instance, there is extensive research on the commonality of language for international trade and factor mobility. In a widely read contribution, Guiso, Sapienza and Zingales (2009, henceforth GSZ) alluded to a different role of cultural proximity in international economic exchange running through trust considerations. They present empirical evidence suggesting that the higher average trust that citizens of a country importing goods have in citizens of their partner country, which is referred to as “destination-to-source (DtS) trust”, has a significant and economically important causal effect on bilateral trade across countries. To address endogeneity concerns, GSZ aim to isolate the exogenous variation of DtS trust with two indicators, a measure of physical dissimilarities between the ‘representa-

tive' individuals in two countries (called "somatic distance") and a measure of religious similarity. GSZ acknowledge that these instruments may affect international trade via cultural and institutional channels other than bilateral trust, questioning the validity of their identification strategy. Yet, they argue that their positive and significant IV coefficient on DtS trust is evidence that cultural proximity is an important determinant of international trade, even if the instruments do not satisfy the exclusion restriction.

First, this chapter reconsiders the relationship between bilateral trust and international trade flows in an attempt to replicate the results of GSZ by thorough sensitivity analysis.¹ In fact, there is a large degree of freedom when constructing an indicator of somatic distance that may serve as an instrument for bilateral trust. The robustness of their IV results is examined by defining seven alternative measures of somatic distance in addition to the one used by GSZ and by estimating the reduced-form equation where trade flows are regressed on all explanatory variables and on somatic distance and religious similarity. As all somatic distance indicators are equally valid and strong instruments, it should not matter for consistent IV estimates which indicator is chosen to instrument bilateral trust with. Using the identification strategy of GSZ and employing their somatic distance indicator as an instrument, the estimation results suggest that an increase of one standard deviation in instrumented DtS trust increases aggregated export flows by 24 percent on average. This basically replicates their original finding. However, neither the alternative somatic distance measures nor religious similarity are significant when estimating the reduced-form equation. Moreover, according to Fehr (2009), religious similarity in particular may violate the exclusion restriction when examining the relationship between bilateral trust and international trade. When not excluding reli-

¹Trade is often characterised by incomplete contracts as it is too costly to take into account or even know all contingencies when establishing them. Furthermore, it can be difficult to negotiate, monitor and enforce contracts, especially in international trade where the commercial partners are established in different jurisdictions (Rodrik, 2000). As a result, profitable trade opportunities might not be realised, unless the parties trust each other (Akerlof, 1970; Arrow, 1972; Putnam, 1993; Greif, 1993, 2000; Coleman, 1994; Kollock, 1994; Fukuyama, 1995; Knack and Keefer, 1997; Paldam, 2000; Dyer and Chu, 2003).

gious similarity at the second stage of the IV estimation, the coefficient of bilateral trust becomes insignificant and its magnitude declines considerably, sometimes even becoming negative, as soon as it is not instrumented with the original indicator used by GSZ. Thus, although not all of the possible identification problems in the analysis by GSZ can be solved, the main contribution of this chapter regarding international trade is to show that the conclusion reached by GSZ cannot be supported using their approach.

The second part of this chapter focuses on the relationship between bilateral trust and international migration.² Potentially, trust in the citizens of a host country may have an impact on the decision to migrate to a foreign country. Generally, individuals only migrate to a foreign country if the expected migration benefits exceed the expected migration costs. However, forming such expectations is difficult because migrants are generally not fully aware of the economic, social, political, institutional and cultural environment of potential host countries. In such a context, their decision to migrate may also rely on the trust they generally have in citizens of the destination country. This bilateral trust, which is referred to as “source-to-destination (StD) trust”, might change the way expectations about the costs and benefits of moving abroad are formed. Thus, there is some reason to believe that StD trust may directly affect international migration by changing its expected net return. Likewise, the trust that citizens from the destination country grant citizens from the source country (i.e. DtS trust) may play a role in the migration decision. For instance, it may affect immigration policies towards specific countries or regions.

To test these hypotheses, a structural equation is derived from a random utility maximisation model. This equation is then estimated using the IV strategy suggested by GSZ, and the robustness of the results are examined using a sensitivity analysis similar to the one used in the context of international trade. When using any of the eight

²GSZ studied the effect of trust on international capital flows, in addition to trade flows, but did not consider international labour migration. Future research may attempt replicating the findings of GSZ with respect to international capital mobility.

measures of somatic distance as the sole instrument, IV estimation does not yield any significant and quantitatively important coefficient of bilateral trust.

The rest of the chapter is organised as follows. The next section gives a brief account of the literature concerning trust effects on macroeconomic outcomes. Section 3 analyses the causal effect of bilateral (DtS) trust on international trade, extensively discussing the empirical model and identification strategy before presenting the results. Section 4 proposes a structural model and similar identification strategy to analyse the effects of both StD and DtS trust on international migration and presents empirical results. The last section consists of the conclusion.

2.2 Related Literature

This chapter is part of a growing literature that analyses the role of cultural proximity and trust in economic outcomes. This section focuses on empirical studies employing aggregate data and ignores the microeconomic trust literature that is largely based on experimental data, on which Fehr (2009) provides an excellent survey.

Comparing Italian regions, Putnam (1993) finds that intra-regional trust increases participation in social activities, facilitates cooperation and improves the effectiveness of institutions.³ More recently, empirical studies suggest that trust within a region fosters economic development and growth through its positive effect on total factor productivity (Bjornskov, 2006), on financial development (Guiso et al., 2004, 2008b), and on the rate of investment (Knack and Keefer, 1997; Zak and Knack, 2001). Algan and Cahuc (2010) and Tabellini (2010) find a causal effect of inherited and historically determined “general” trust (proposed by the World Values Surveys) within regions on economic growth. By contrast, this chapter is concerned with the effects of bilateral (i.e. inter-regional) trust

³On trust and institutions, see also La Porta et al. (1997), Alesina and La Ferrara (2000), Bjornskov (2006), Tabellini (2008, 2010), Bloom, Sadun and Reenen (2009), and Aghion, Algan, Cahuc, and Shleifer (2010).

on the bilateral movement of goods and labour.

The related literature on the role of cultural proximity in international trade and migration has largely focussed on the role of common language, using various indicators (e.g. Falck, Heblich, Lameli and Südekum, 2012; Isphording and Otten, 2013; Egger and Lassmann, 2013; Melitz and Toubal, 2014; Chiswick and Miller, 2015). To examine the role of bilateral trust (possibly through somatic distance and religious similarity) across countries in international migration patterns, I follow Bertoli and Moraga (2013) and Ortega and Peri (2013), and derive a structural equation from a random utility maximisation model (see also Roy, 1951; Sjaastad, 1962; Anderson, 1979; Borjas, 1987, 1989). This approach has also been used recently to examine the determinants of migration flows, for instance, migration policies (Mayda, 2010; Ortega and Peri, 2013), the variations in migration flows to the United States over time (Clark, Hatton and Williamson, 2007), the role of networks in the decision to move abroad (Pedersen, Pytlikova and Smith, 2008; Beine, Docquier and Ozden, 2011), the sorting and selection of potential migrants (Grogger and Hanson, 2011), the role of climatic factors (Beine and Parsons, 2012), and the role of similar religious backgrounds in international migration (see Chapter 4).

2.3 Bilateral Trust and International Trade

This section presents the model, the data and the identification strategy employed to investigate the relationship between DtS trust and international trade flows.

2.3.1 Trade Equations and Data

The gravity-type specification of trade that includes DtS trust as regressor comes from GSZ:⁴

$$\log(\text{export}_{sdt}) = \beta_0 + \beta_1 \text{trust}_{dst} + \mathbf{X}'_{sd} \gamma + \lambda_{st} + \lambda_{dt} + \epsilon_{sd,t}, \quad (2.1)$$

where the dependent variable, $\log(\text{export}_{sdt})$, is the natural logarithm of the aggregated commodity export flows from country s to country d in year t ;⁵ trust_{dst} is the average DtS trust observed in year t across individuals in country d , which participated in a Eurobarometer survey, given to citizens in country s , according to the answer to the following question: *“I would like to ask you a question about how much trust you have in people from various countries. For each, please tell me whether you have a lot of trust, some trust, not very much trust, or no trust at all.”* It was asked in the years 1970, 1976, 1980, 1983, 1986, 1990, 1991, 1993, 1994, and 1996, with the sample size increasing over time.⁶ Analogously to the study by GSZ, the individual answers are coded as 1 (no trust at all), 2 (not very much trust), 3 (some trust) and 4 (a lot of trust). For reasons of comparability, I follow GSZ and focus on countries that were members of the European Economic Area before 1997 and Norway. \mathbf{X}'_{sd} is a vector of time-invariant bilateral variables that capture trade costs (Anderson and van Wincoop, 2004). It includes dummy variables that take the value one whenever two countries share a border, an official language or when their legal systems have the same origins.⁷ Following GSZ, I further include an indicator of press coverage that measures how many times a partner country was mentioned in the national

⁴For a short overview of the origin of the gravity model and the corresponding literature, see Anderson (1979, 2011), Anderson and van Wincoop (2003), Baldwin and Taglioni (2006), Head and Mayer (2013a), and Felbermayr, Grossmann and Kohler (2015).

⁵Aggregated commodity export flows are taken from the UN Comtrade Database; <http://comtrade.un.org/db/default.aspx>. Unfortunately, data on trade in services cannot be included as it has only been collected since the year 2000. There are no zero trade observations for the country sample included in the analysis.

⁶See <http://zacat.gesis.org/webview/>. In 1996, citizens of 17 European countries were asked to indicate the trust they had in citizens of 25 EU and non-EU countries.

⁷These dyadic dummy variables come from the CEPII Gravity Dataset generated by Head, Mayer and Ries (2010, 2013); see www.cepii.fr.

newspapers,⁸ a proxy for transportation costs⁹ and a measure of common linguistic roots, which can take values between zero and one:¹⁰ it is one whenever two countries share an official language, zero when the two official languages come from different language families, and takes values between zero and one whenever the official languages share some common nodes. Finally, two different measures of geographical distance between country pairs are employed. First, we use the indicator for geographical distance proposed by Frankel, Stein and Wei (1995) that was also employed by GSZ. This indicator measures the (log) distance in kilometres between two capital cities and assumes that the whole population is concentrated in one geographical point, thereby failing to capture the distribution of economic activity within a country. This distance measure is only used for direct comparison with the results of GSZ as Head and Mayer (2002) argue that the inclusion of such an unweighted distance measure in a gravity-type equation systematically inflates the estimated border effect because it overestimates the geographical distances within a country relative to international distances. Therefore, the second measure of geographical distance between country pairs employed in this chapter is the one provided by Mayer and Zignago (2011), which is a population-weighted indicator of distances between big cities. λ_{st} and λ_{dt} are time-varying country dummies that account for country- and time-specific determinants of international trade. According to Baldwin and Taglioni (2006), these dummies mitigate the bias stemming from the omission of what Anderson and van Wincoop (2004, 2003) call “multilateral resistance” to trade. The last term in equation (2.1), ϵ_{sdt} , is a mean-zero random variable. The computed standard errors are

⁸The measure is based on data from www.factiva.com, which collects and archives informations made available by over 30,000 newspapers, journals, magazines, web pages, etc. on a broad range of contents from over 200 countries. It is constructed as follows: “In Factiva, we searched the newspaper with the highest circulation for each country. For each pair of countries i and j , we recorded the number of articles in the newspaper of countries that mentioned country j or its citizens in the headline. We divided this number by the number of total news stories on foreign countries” (GSZ; p. 1106).

⁹I employ the prices of shipping a 1,000 kg unspecified freight type load with no special handling in June 2011, as provided at <http://importexportwizard.com>. This measure is based on Giuliano, Spilimbergo and Tonon (2006).

¹⁰Data are drawn from www.ethnologue.com; also see Lewis, Simons and Fennig (2013).

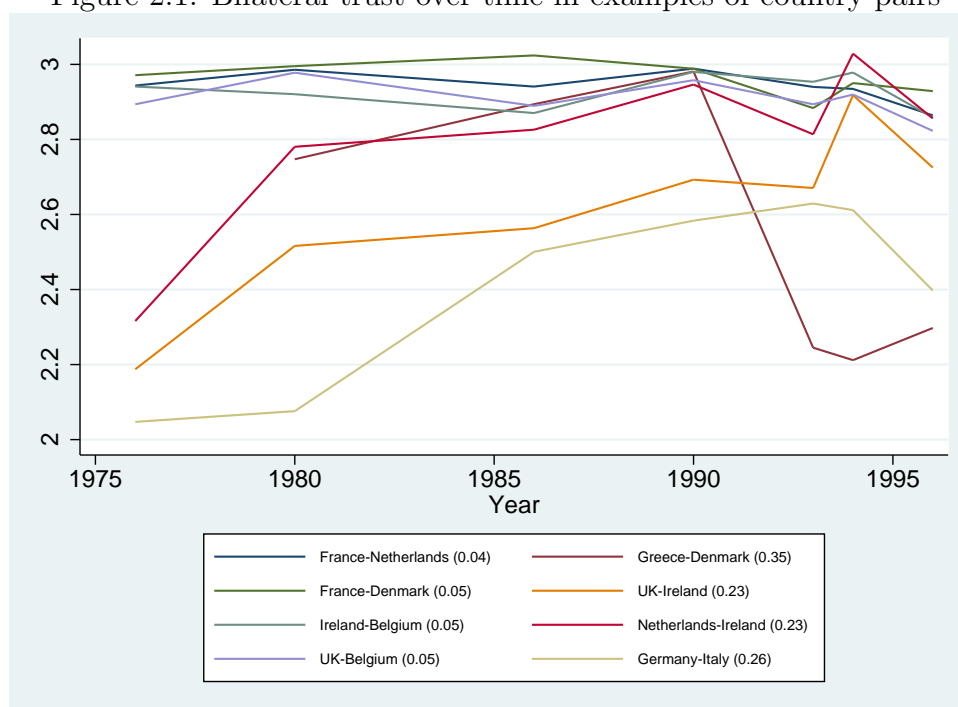
robust to heteroscedasticity of unknown and arbitrary form. Moreover, they are clustered at the country pair which allows the standard errors to be correlated over time within country pair, but assumes that they are uncorrelated with errors of a different country pair.

2.3.2 Identification and Instrumental Variables

A particular concern is the potential inconsistency of the OLS estimate of the coefficient β_1 on DtS trust ($trust_{dst}$). This might be caused by omitted variables and measurement errors, especially since the variable is based on survey data. GSZ instrument $trust_{dst}$ with a time-invariant proxy of religious similarity and a time-invariant indicator of somatic distance that measures the distance between three anthropometric characteristics observed in the native populations of two countries: the average height, the prevailing hair colour, and the average cephalic index, which measures the average width and length of an individual's skull. In his experiment, DeBruine (2002) finds that people trust other people who resemble themselves significantly more. A decrease in somatic distance should thus increase bilateral trust. The second instrument, religious similarity, measures the probability that a randomly chosen individual in country d has the same religion as a randomly chosen individual in country s . As religiously similar individuals may share common values and beliefs, an increase in the variable may positively affect bilateral trust.

The employed instruments are time-invariant, whereas the trust measure is not. In fact, the trust variable varies over time in a non-negligible manner. Figure 2.1 displays the evolution of DtS trust over time for selected country pairs with comparably high and low fluctuations. For instance, average Greek to Danish trust fluctuated considerably over time, with a standard deviation of 0.35 across the various available years (reaching 2.56 on average). The average German to Italian trust and its standard deviation over time is 2.41 and 0.26, respectively. By contrast, French to Dutch trust (2.94 on average)

Figure 2.1: Bilateral trust over time in examples of country pairs



Notes: This figure illustrates bilateral trust between country pairs over time with the highest and lowest standard deviations, given that bilateral trust was observed over at least six years (Eurobarometer surveys).

and French to Danish trust (2.96 on average) is pretty stable over time; their standard deviations are only 0.04 and 0.05, respectively.

One advantage of the instrumentation strategy may be seen in the attempt to elicit the culturally rooted (thus stable) and ideally exogenous component of bilateral trust. GSZ provide survey evidence from additional questions that separate risk and trust considerations; the correlation patterns of the employed DtS trust variable suggests that it indeed “reflects the subjective probability that a random person is trustworthy” (GSZ, p. 1100).

The construction of the instruments, their potential problems and the contribution to identify the causal effect of DtS trust on international trade flows are discussed next.

Religious Similarity

The first employed instrument for DtS trust, an indicator for religious similarity, is constructed with data from the World Value Surveys presented by Guiso et al. (2003). They report the national distribution of population by the following religious affiliations: Catholic, Protestant, Jewish, Muslim, Hindu, Buddhist, no religious affiliation and other affiliations. This information is used to compute the probability that two randomly chosen individuals in two different countries have the same religion. However, religious similarity may not satisfy the exclusion restriction. First, as Fehr (2009, p. 259) states: “Common religion not only influences trust, but does many other things as well, because it is probably associated with more frequent interactions between the two countries, compared to cases with different religions, and this may well have a direct impact on trade.” Second, there is reason to believe that religiously similar people share preferences for certain tradable goods. An obvious example concerns preferences for food. For instance, a Muslim living in Switzerland might import meat from France (where there is a large Muslim community) because he or she only eats “halal” meat.

Because potential validity problems are particularly severe when religious similarity is employed to instrument bilateral trust, specifications in which religious similarity enters as a control variable in the trade regression rather than being excluded at the second stage of the IV estimations are preferred.

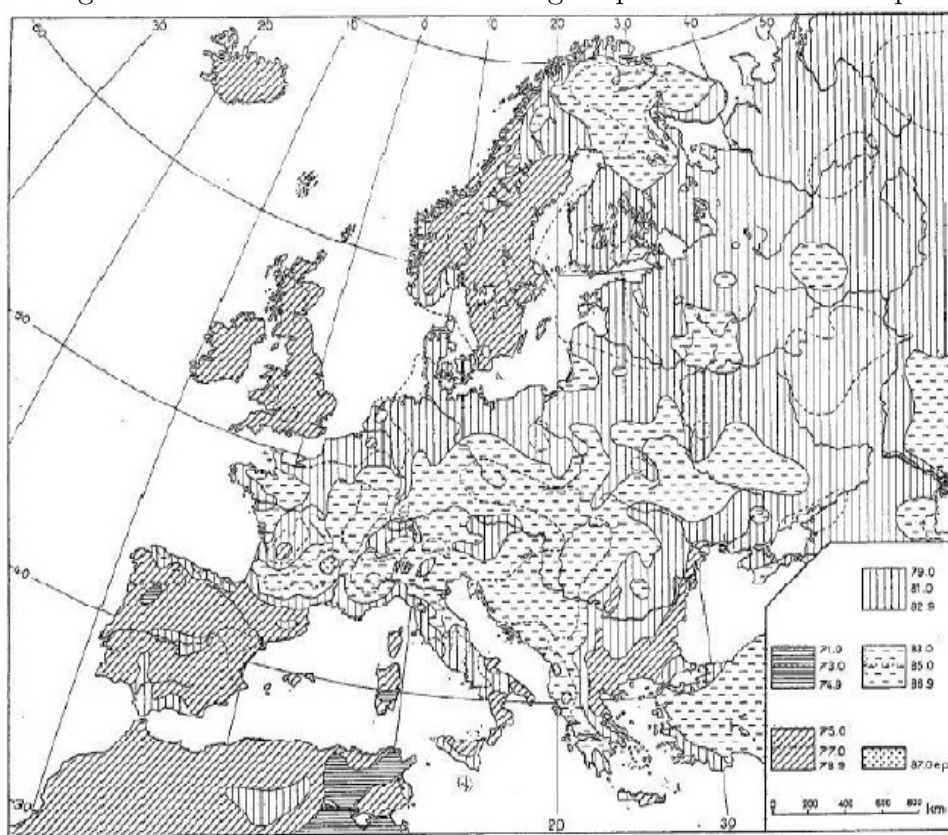
Somatic Distance

Indicators of somatic distance, used by GSZ as a second instrumental variable for bilateral trust, can be constructed in many different ways. Four measures are made available in the online appendix to the paper by GSZ (Guiso et al., 2008a).¹¹ They are constructed based on four anthropometric indicators: hair colour, cephalic index, height and skin colour. The first three anthropometric indicators were published by Biasutti (1959). He

¹¹See www.kellogg.northwestern.edu/faculty/sapienza/htm/somaticdistance.zip.

classifies the world into five categories of hair colours: 1 (blond prevails), 2 (mix of blond and dark), 3 (dark prevails), 4 (sporadic presence of blond), and 5 (exclusively dark). He further differentiates five categories of average cephalic indexes, going from 71.0 to 86+, and six categories of height. For illustration, Figure 2.2 reprints the distribution of the average cephalic index for European regions from Biasutti (1959).

Figure 2.2: Distribution of the average cephalic index in Europe



Source: (Biasutti, 1959, p. 48)

Using today's borders, the populations of many countries have several of these traits, in which case GSZ focus on the predominant category and ignore the others. They assign scores to the different groups of hair colours, cephalic indices, heights and skin colours, and "compute the somatic distance between two countries as the sum of the absolute value of the difference in each of these traits" (GSZ, p. 1107). Their constructed four measures of somatic distance are all computed in the same fashion but are based on

different combinations of these four physical characteristics. One measure of somatic distance sums the absolute distance in all four dimensions. The sole measure used in the estimations of GSZ ignores the difference in skin colour. Another measure is based on differences in hair colour, height and skin colour. Finally, yet another measure only sums the absolute differences in hair colour and height.

In this chapter, four additional measures of somatic distance are defined. To do this, the score of 1 is assigned to the category corresponding to the lowest average cephalic index (71.0–74.9), 2 to the second category (75.0–78.9), and so on. The six categories of height defined by Biasutti (1959) are coded the same way, assigning the lowest score of 1 to the category “157.9 cm or less” and the highest score of 6 to “178 cm or more”. First, the instructions given by Guiso et al. (2008a, p. 3) are followed exactly in order to try replicating the single measure of somatic distance used by GSZ. The second measure is based only on the absolute differences in hair colour and height, as it is hardest to define which category of cephalic index prevails. The next two measures differ from the others by allowing a country to fall into two categories and weighting them according to population density.¹² One measure is again based on the three anthropometric indicators proposed by Biasutti, while the other ignores the differences in cephalic index. The data on population density comes from two figures: a map with the population density in 1989 provided by the European Environment Agency and one with the population density in

¹²For some countries, it is very difficult to decide which trait prevails, especially when focusing on the different categories of cephalic index. For example, in Figure 2.2, northern Germany falls into category 3, “79.0–82.9”, while the other half of Germany falls into category 4, “83.0–86.9”. Guiso et al. (2008a) do not indicate how they decide which one of these categories prevails in such situations. I partially succeed in replicating their somatic distances when I decide visually (based on Figure 2.2) which trait covers a larger area and assume that it is the dominant characteristic. However, this procedure is somewhat arbitrary, especially when ignoring the distribution of the population. As the German population is approximately equally distributed, I would ignore the characteristics of half of the population if I arbitrarily decided that either category 3 or 4 prevails. To account for this, our two measures of somatic distance allow a country to be home to two categories of traits, depending on the distribution of the population. In the case of Germany, I find that the categories of cephalic index 3 (“79.0 - 82.9”) and 4 (“83.0 - 86.9”) roughly share the German territory and population. Therefore, I decide to assign it the score of 3.5. This measure is certainly not flawless, but it allows us to further explore the robustness of the results published in GSZ.

Table 2.1: Summary Statistics

Variable	Mean	Median	Std. dev.	Min	Max	N
Panel A: International trade and destination-to-source trust						
Export flows (from s to d , log)	14.56	14.63	1.64	9.57	17.88	679
DtS trust	2.73	2.72	0.28	1.99	3.65	679
Press coverage	0.04	0.02	0.05	0.00	0.31	679
Weighted distance (log)	7.00	7.06	0.55	5.08	8.13	679
Distance between capitals (log)	6.90	7.07	0.69	5.15	8.12	679
Transportation costs (log)	5.19	5.18	0.07	5.08	5.42	679
Common border	0.20	0.00	0.40	0.00	1.00	679
Common language	0.08	0.00	0.28	0.00	1.00	679
Same legal origin	0.31	0.00	0.46	0.00	1.00	679
Common linguistic roots	0.63	0.67	0.20	0.00	1.00	679
Religious similarity	0.34	0.33	0.25	0.00	0.87	679
<i>Somatic distance</i>						
<i>Available in Guiso et al. (2008a)</i>						
- hair colour, height, cephalic index, skin	2.93	3.00	1.37	0.00	6.00	679
- hair colour, height, skin	2.05	2.00	1.29	0.00	5.00	679
- hair colour, height, cephalic index	2.48	2.00	1.20	0.00	5.00	679
- hair colour, height	1.60	2.00	1.08	0.00	4.00	679
<i>Own elaboration, following the instructions in Guiso et al. (2008a)</i>						
- hair colour, height, cephalic index	2.35	2.00	1.21	0.00	5.00	679
- hair colour, height	1.48	2.00	0.96	0.00	3.00	679
<i>Own elaboration, allowing for a country to fall into two categories of traits</i>						
- hair colour, height, cephalic index	2.15	2.00	1.15	0.00	4.50	679
- hair colour, height	1.47	1.50	1.04	0.00	3.00	679
Panel B: International migration and source-to-destination trust						
Gross immigration flows (log)	6.84	6.84	1.87	2.08	12.13	450
StD trust	2.79	2.79	0.30	1.99	3.65	450
Diff. in GDP p.c. (%)	0.34	0.18	0.66	-0.62	3.55	450
Common language	0.09	0.00	0.28	0.00	1.00	450
Weighted distance (log)	6.91	7.01	0.62	5.08	8.13	450
Common border	0.21	0.00	0.41	0.00	1.00	450
Same legal origin	0.32	0.00	0.47	0.00	1.00	450
Migration stock 1960 (log)	4.86	0.00	5.56	0.00	13.50	450
Religious similarity	0.31	0.32	0.24	0.00	0.87	450
<i>Somatic distance</i>						
<i>Available in Guiso et al. (2008a)</i>						
- hair colour, height, cephalic index, skin	2.87	3.00	1.40	0.00	6.00	450
- hair colour, height, skin	2.11	2.00	1.34	0.00	5.00	450
- hair colour, height, cephalic index	2.43	3.00	1.18	0.00	5.00	450
- hair colour, height	1.67	2.00	1.09	0.00	4.00	450

Table 2.1 – *cont.*

Variable	Mean	Median	Std. dev.	Min	Max	N
Panel B - <i>cont.</i>						
<i>Own elaboration, following the instructions in Guiso et al. (2008a)</i>						
- hair colour, height, cephalic index	2.35	2.00	1.20	0.00	5.00	450
- hair colour, height	1.56	2.00	0.97	0.00	3.00	450
<i>Own elaboration, allowing for a country to fall into two categories of traits</i>						
- hair colour, height, cephalic index	2.10	2.00	1.13	0.00	4.50	450
- hair colour, height	1.51	1.50	1.03	0.00	3.00	450
Panel C: International migration and Destination-to-Source trust						
Gross immigration flows (log)	6.84	6.82	1.87	2.08	12.13	463
DtS trust	2.76	2.75	0.30	2.04	3.65	463
Diff. in GDP p.c. (%)	0.38	0.19	0.70	-0.62	3.55	463
Common language	0.09	0.00	0.28	0.00	1.00	463
Weighted distance (log)	6.91	7.01	0.62	5.08	8.13	463
Common border	0.21	0.00	0.40	0.00	1.00	463
Same legal origin	0.33	0.00	0.47	0.00	1.00	463
Migration stock 1960 (log)	5.04	0.00	5.57	0.00	13.50	463
Religious similarity	0.32	0.32	0.24	0.00	0.87	463
<i>Somatic distance</i>						
<i>Available in Guiso et al. (2008a)</i>						
- hair colour, height, cephalic index, skin	2.88	3.00	1.40	0.00	6.00	463
- hair colour, height, skin	2.12	2.00	1.34	0.00	5.00	463
- hair colour, height, cephalic index	2.44	3.00	1.19	0.00	5.00	463
- hair colour, height	1.68	2.00	1.09	0.00	4.00	463
<i>Own elaboration, following the instructions in Guiso et al. (2008a)</i>						
- hair colour, height, cephalic index	2.37	2.00	1.20	0.00	5.00	463
- hair colour, height	1.57	2.00	0.97	0.00	3.00	463
<i>Own elaboration, allowing for a country to fall into two categories of traits</i>						
- hair colour, height, cephalic index	2.11	2.00	1.14	0.00	4.50	463
- hair colour, height	1.52	1.50	1.03	0.00	3.00	463

Notes. This table presents the descriptive statistics of the sample used to estimate the effect of DtS trust on commodity export flows (Panel A), the impact of StD trust on gross immigration flows (Panel B), and the effect of DtS trust on gross immigration flows (Panel C). The data sources are described in sections 2.3.1 and 2.4.1. All samples include observations for European countries over the years for which I have trust data (1970, 1976, 1980, 1983, 1986, 1990, 1991, 1993, 1994, and 1996). The number of observations varies across the panels because of missing data.

2010 made available by the Nordic Center for Spatial Development.¹³ Not surprisingly, the somatic distance measures are highly correlated (and I use only one of them at the same time in each regression). The correlation coefficients between two somatic distance

measures vary from 0.65 to 0.93.¹⁴

Unfortunately, when instrumenting DtS trust only with somatic distance, the exogeneity of the instrument cannot be statistically verified. Yet, somatic distance might also affect international trade via cultural and institutional factors other than trust. To mitigate this concern, the migration regression includes dyadic variables that could be correlated with somatic distance, such as geographical distance between countries, common legal origin and indicators of common language.¹⁵ Additionally, somatic distance should not be highly related to these bilateral variables otherwise it may raise multicollinearity issues. To address this concern, the measure of common linguistic roots is regressed on somatic distance (one indicator per regression) in addition to the other time-invariant bilateral variables included in the analysis. The results of this regression suggest that common linguistic roots and somatic distance measures are negatively correlated, albeit the coefficient on somatic distance is not always significantly different from zero (see appendix). Moreover, the R^2 of these regressions range from 0.55 to 0.58, further suggesting that multicollinearity is not a problem. Finally, when an endogenous variable is only instrumented with one variable, Murray (2006) suggests estimating the regression of interest again, using alternative instruments separately, and observing how the coefficient on the endogenous variable behaves. If this procedure yields estimates that only vary insignificantly from one another, then the credibility of the instrumental variable is strengthened. Such a sensitivity analysis can be performed here because there is a large degree of freedom in constructing a measure of somatic distance. The different indicators of somatic distance presented above all capture the physical dissimilarities between the representative individuals in two countries and are constructed in a similar fashion. It

¹³See Stanners and Bourdeau (1994) or www.eea.europa.eu/publications/92-827-5122-8/page008.html for the chart on population density in 1989 and Roto (2011) or www.nordregio.se/en/Maps-graphs/ for the population density in 2010.

¹⁴See the appendix for a correlation matrix.

¹⁵Regarding the latter, in a sensitivity analysis (section 2.3.4) I also employ other language-related measures provided by Melitz and Toubal (2014).

should therefore not matter for consistent results which one of them is used to capture the exogenous variation of bilateral trust. The main contribution of this chapter is thus to perform a sensitivity analysis with respect to these alternative measures, thereby shedding light on the economic question of interest: does bilateral trust and, more generally, cultural proximity affect international trade, according to the approach used by GSZ?

2.3.3 Results

The main results of estimating the trade regression are presented and discussed here. The descriptive statistics of the samples used to analyse the relationship between international trade and DtS trust are presented in Panel A of Table 2.1.

Replicating GSZ: OLS Estimates

Tables 2.2 and 2.3 present the results of estimating equation (2.1). In Table 2.2, the indicator of geographical distance between countries is similar to the one employed by GSZ (distance between two capital cities). In this case, the estimated coefficients on bilateral trust are very similar to the ones published in their study.¹⁶ However, the coefficient on geographical distance is barely significant. As already mentioned, this might be the result of the inadequacy of the unweighted indicator measuring the distance between two capital cities. Indeed, when replacing it with the outlined population-weighted distance indicator in Table 2.3, the estimated coefficients on bilateral distance become significant and have point estimates close to -1 , which corresponds to the magnitude generally estimated in trade regressions based on the gravity model (Mayer and Zignago, 2011, p. 11). In addition, the estimated border effect decrease, supporting the suggestion made by Head and Mayer (2002) that measuring geographical distance by the distance between capital cities inflates the border effect. More importantly, when including a weighted measure of distance in the specification, the point estimates of the coefficients on DtS trust decrease.

¹⁶Compare to Table IV in GSZ (pp. 1116 f.).

Table 2.2: Determinants of international trade - replicating GSZ

	OLS (1)	OLS (2)	OLS (3)	IV-SR (4)	IV-S (5)	RF (6)
DtS trust	0.37* (0.21)	0.29 (0.20)	0.28 (0.20)	1.27*** (0.38)	1.50*** (0.50)	
Common language	0.45** (0.21)	0.26 (0.16)	0.25 (0.17)	0.15 (0.15)	0.17 (0.15)	0.30* (0.16)
Distance btw capitals (log)	-0.05 (0.19)	-0.26 (0.18)	-0.24 (0.18)	-0.32* (0.16)	-0.30* (0.17)	-0.22 (0.17)
Common border	0.49*** (0.14)	0.42*** (0.12)	0.41*** (0.12)	0.37*** (0.12)	0.38*** (0.12)	0.34*** (0.12)
Press coverage	1.37 (1.12)	0.57 (1.11)	0.66 (1.12)	1.57 (0.96)	1.21 (1.05)	0.81 (1.17)
Transportation costs (log)	-4.41** (1.97)	-1.82 (1.90)	-1.82 (1.85)	-0.09 (1.65)	-0.43 (1.72)	-1.43 (1.82)
Same legal origin		0.45*** (0.14)	0.39** (0.15)	0.32** (0.14)	0.38** (0.16)	0.34** (0.15)
Common linguistic roots			0.25 (0.31)	0.17 (0.27)	0.11 (0.29)	0.12 (0.30)
Religious similarity					-0.19 (0.22)	0.05 (0.16)
Somatic distance (GSZ)						-0.09*** (0.03)
<i>Relevance</i>						
K-P rk LM statistic (p-value)				17.91 (0.00)	16.5 (0.00)	
<i>Weak identification</i>						
K-P rk Wald statistic				17.05	26.03	
<i>Over-identification</i>						
Hansen J-statistic (p-value)				0.780 (0.38)		
Observations	679	679	679	679	679	679
R-squared	0.97	0.97	0.98			0.97

Notes: The dependent variable is the natural logarithm of aggregated export flows from country s to country d (UNComtrade). DtS trust measures the average trust that citizens in importing country d grant citizens in exporting country s (Eurobarometer surveys). Somatic distance is the measure used by GSZ that sums the absolute value of the difference in hair colours, heights, and cephalic indices. All equations include country-year dummies. The Kleibergen-Paap rk LM and Wald statistics are the robust statistics in case of non-i.i.d. disturbances. Estimated standard errors reported in parentheses are clustered at the country pair. Coefficients are statistically different from zero at the ***1%, **5%, and *10% level. Columns (1) to (3) present OLS estimates; columns (4) and (5) present IV estimates with somatic distance and religious similarity as instruments (IV-SR) and with somatic distance as the only instrument (IV-S), respectively. RF refers to the reduced-form of the dependent variable.

Table 2.3: Trade regression - using a weighted distance indicator

	OLS (1)	OLS (2)	OLS (3)	IV-SR (4)	IV-S (5)	RF (6)
DtS trust	0.27 (0.18)	0.13 (0.17)	0.13 (0.17)	0.85** (0.35)	0.96** (0.47)	
Common language	0.38** (0.16)	0.24** (0.11)	0.25** (0.12)	0.25** (0.10)	0.24** (0.10)	0.30** (0.12)
Weighted distance (log)	-0.88*** (0.25)	-1.03*** (0.22)	-1.04*** (0.23)	-0.94*** (0.24)	-0.91*** (0.25)	-0.99*** (0.23)
Common border	0.29*** (0.11)	0.24** (0.10)	0.24** (0.10)	0.25*** (0.09)	0.26*** (0.10)	0.21** (0.10)
Press coverage	0.13 (1.05)	-1.01 (0.95)	-1.06 (0.96)	-0.34 (0.89)	-0.42 (0.93)	-0.80 (0.98)
Transportation costs (log)	0.42 (1.91)	2.27 (1.66)	2.31 (1.68)	2.48 (1.57)	2.27 (1.68)	2.49 (1.66)
Same legal origin		0.45*** (0.10)	0.47*** (0.13)	0.41*** (0.13)	0.42*** (0.13)	0.42*** (0.13)
Common linguistic roots			-0.07 (0.32)	-0.11 (0.28)	-0.11 (0.28)	-0.15 (0.31)
Religious similarity					-0.06 (0.19)	0.11 (0.14)
Somatic distance (GSZ)						-0.06* (0.03)
<i>Relevance</i>						
K-P rk LM statistic (p-value)				16.95 (0.00)	14.65 (0.00)	
<i>Weak identification</i>						
K-P rk Wald statistic				16.93	22.99	
<i>Over-identification</i>						
Hansen J-statistic (p-value)				0.13 (0.72)		
Observations	679	679	679	679	679	679
R-squared	0.97	0.97	0.98			0.97

Notes: See notes for Table 2.2

The positive OLS estimates reported in columns (1) to (3) of Table 2.3 are all insignificant. Notably, whereas GSZ (p. 1105, footnote 4) suggest that it does not matter much which geographical distance measure is used, our results suggest the opposite.

Replicating GSZ: IV Estimates

Next, as DtS trust is likely to be correlated with the error term, the IV approach proposed by GSZ is applied.¹⁷ When instrumented with both the measure of religious similarity and the measure of somatic distance used by GSZ, the coefficient on DtS trust becomes significant at the 5 percent level (column (4) of Table 2.3). This suggests that an increase in DtS trust of one standard deviation increases aggregated commodity export flows on average by 24 percent, which is more than six times the effect predicted by the OLS estimate. Both instruments enter significantly in the first-stage regression. Bilateral trust seems to increase with religious similarity and is reduced when physical dissimilarities between two countries become more important. The p -value of the Kleibergen-Paap rk LM statistic also suggests that the instruments are jointly significant in the first stage of the two-stage least-squares (2SLS) regression.¹⁸ In addition, the Wald statistic based on the Kleibergen-Paap rk statistic is larger than 10, indicating a sufficiently strong correlation between the instruments and DtS trust so that weak identification problems should not be an issue.¹⁹ Finally, the instruments pass the Hansen J-test intended to verify their exogeneity, that is, that the instruments only affect the dependent variable via the trust channel.

The standard statistical tests thus suggest that the IV strategy used by GSZ is valid.

¹⁷The endogeneity of bilateral trust is verified with a control function approach (see Wooldridge, 2010, p. 127) and an endogeneity test that is robust to arbitrary heteroscedasticity, following Baum, Schaffer and Stillman (2007). Both tests reject the null hypothesis that bilateral trust is exogenous at conventional levels.

¹⁸The Kleibergen-Paap rk LM statistic is the efficient first-stage statistic used to verify the relevance of the instruments when non-i.i.d. disturbances are assumed. Rejection of the null hypothesis suggests that the model is identified, i.e. that the instruments are relevant.

¹⁹In the presence of i.i.d. disturbances, weak identification problems are detected with the Cragg-Donald F-statistic, which is compared to the critical values published by Stock and Yogo (2005). However, in case of non-i.i.d. disturbances, the Kleibergen-Paap rk Wald statistic is the efficient statistic (Kleibergen and Paap, 2006; Kleibergen and Schaffer, 2007; Baum et al., 2007). So far, no critical values have been computed for this statistic, and in practice, it is usually compared to the threshold number of 10 recommended by Staiger and Stock (1997); see also Stock, Wright and Yogo (2002). As a robustness test, I compute the limited information maximumlikelihood (LIML) estimates of all our 2SLS regressions and find that the bilateral trust coefficients change only slightly in their size and that the levels of statistical significance are identical to the IV estimates. The results of this sensitivity analysis are available in the appendix.

Nevertheless, at least religious similarity is suspected to affect international trade through channels other than bilateral trust. This casts doubts on the results presented in column (4) and also on the over-identification test, as the latter is only reliable when the instruments are valid (Murray, 2006). Therefore, an alternative specification including religious similarity as a covariate is estimated using an 2SLS approach where the exogenous variation of bilateral trust is captured with a single instrument, the indicator of somatic distance used by GSZ. The results of estimating this specification are presented in column (5). The coefficient on DtS trust increases slightly and the significance is unchanged compared to column (4).

Reduced-Form Estimates

The reduced-form equation of the dependent variable is “derived by substituting the first-stage equation into the causal relation of interest” (Angrist and Pischke, 2009, p. 121)²⁰. The first-stage regression is

$$trust_{dst} = \delta_0 + \delta_1 S_{ds} + \mathbf{X}'_{sd}\eta + \lambda_{st} + \lambda_{dt} + u_{sdt}, \quad (2.2)$$

where S_{ds} is the indicator of somatic distance between country d and country s , and \mathbf{X}'_{sd} contains all time-invariant bilateral exogenous covariates, including the proxy for religious similarity. Substituting (2.2) into (2.1) and rearranging terms yields

$$\begin{aligned} \log(export_{sdt}) &= (\beta_0 + \beta_1\delta_0) + \beta_1\delta_1 S_{ds} + (\beta_1\eta + \gamma)\mathbf{X}'_{sd} + (\beta_1 + 1)\lambda_{st} + \\ &\quad (\beta_1 + 1)\lambda_{dt} + (\beta_1 u_{sdt} + \epsilon_{sdt}) \\ &\equiv \tau_0 + \tau_1 S_{ds} + \mathbf{X}'_{sd}\phi + \hat{\lambda}_{st} + \hat{\lambda}_{dt} + v_{sdt}. \end{aligned} \quad (2.3)$$

²⁰See Anderson and Rubin (1949), Dufour (2003), and Chernozhukov and Hansen (2008) for a formal explanation of this alternative test and Angrist and Krueger (1991, 2001) for an application of this method. See also Baum et al. (2007) for an implementation of the Anderson-Rubin test in Stata. This test verifies whether the instruments are significant in the reduced-form equation of the dependent variable.

$\hat{\lambda}_{st}$ and $\hat{\lambda}_{dt}$ are time-varying country dummies, and v_{sdt} is the error term. If the exclusion restriction is satisfied, then, by assumption, all variables in equation (2.3) are orthogonal to the error term v_{sdt} . This implies that OLS consistently estimates the coefficients and that testing whether $\tau_1 \equiv \beta_1 \delta_1 = 0$ is an alternative way of testing the hypothesis that $\beta_1 = 0$ in equation (2.1). As Angrist and Pischke (2009, p. 213) point out, “if you can’t see the causal relation of interest in the reduced-form, it’s probably not there”.

Column (6) of Table 2.3 shows the results of estimating the reduced-form (eq. (2.3)). As expected from the second-stage results, the estimated coefficient on somatic distance is significant, though only at the 10 percent level. Furthermore, religious similarity is not partially correlated with international trade. This result suggests that religious similarity as used by GSZ is not only a potentially invalid but also an irrelevant instrument, in turn biasing the 2SLS coefficient on bilateral trust (e.g. Murray, 2006; Angrist and Pischke, 2009). This finding supports the choice to estimate alternative specifications that include the proxy for religious similarity at the second stage of the IV approach and to focus most of the discussions on these preferred specifications.

(Lack of) Robustness

To examine the robustness of the results reported in Table 2.3, equation (2.1) is estimated again, keeping the same sample and the same explanatory variables. However, as discussed above, the measure of somatic distance used as instrument for DtS trust varies.

The results of this sensitivity analysis are presented in Table 2.4, which is divided into four panels.²¹ Panel A reports the results of estimating the first-stage regression and Panel B shows the results of estimating the reduced-form equation (2.3). The IV coefficients with and without religious similarity as explanatory variable are presented in Panels C and D, respectively. Each panel is composed of eight columns that differ in the indicator

²¹Only the coefficients on DtS trust, somatic distance, and religious similarity are reported. Complete tables including the estimates of the coefficients on the control variables are available in the appendix.

Table 2.4: Trade: Instrumenting bilateral trust with various measures of somatic distance

	Guiso et al. (2008a)				Replication		Pop. Density	
	HHC (1)	HH (2)	HHCS (3)	HHS (4)	HHC (5)	HH (6)	HHC (7)	HH (8)
Panel A: First-stage regression								
Dependent variable: Destination-to-Source trust								
Somatic distance	-0.06*** (0.01)	-0.09*** (0.02)	-0.06*** (0.01)	-0.07*** (0.01)	-0.05*** (0.01)	-0.09*** (0.02)	-0.05*** (0.01)	-0.08*** (0.02)
Religious similarity	0.18*** (0.06)	0.15** (0.06)	0.20*** (0.06)	0.18*** (0.06)	0.17*** (0.07)	0.14** (0.06)	0.15** (0.06)	0.15** (0.06)
Panel B: Reduced-form equation of international trade								
Dependent variable: Aggregated export flows								
Somatic distance	-0.06* (0.03)	-0.06 (0.05)	-0.02 (0.03)	-0.01 (0.04)	0.01 (0.04)	-0.04 (0.05)	-0.03 (0.03)	-0.06 (0.05)
Religious similarity	0.11 (0.14)	0.09 (0.14)	0.12 (0.14)	0.11 (0.14)	0.12 (0.14)	0.09 (0.15)	0.10 (0.14)	0.09 (0.14)
Panel C: Second-stage estimates using somatic distance and religious similarity as instruments								
Dependent variable: Aggregated export flows								
DtS trust	0.85** (0.35)	0.69** (0.34)	0.46 (0.31)	0.35 (0.35)	0.20 (0.36)	0.55 (0.36)	0.55 (0.37)	0.69* (0.36)
<i>Relevance</i>								
K-P rk LM statistic (p-value)	16.95 (0.00)	23.58 (0.00)	19.89 (0.00)	23.33 (0.00)	18.46 (0.00)	20.40 (0.00)	15.27 (0.00)	20.43 (0.00)
<i>Weak identification</i>								
K-P rk Wald statistic	16.93	21.27	19.95	21.30	13.48	21.58	15.74	20.80
<i>Exogeneity</i>								
Hansen J-statistic (p-value)	0.13 (0.72)	0.02 (0.90)	0.06 (0.80)	0.21 (0.65)	0.58 (0.45)	0.01 (0.91)	0.01 (0.91)	0.02 (0.90)
Panel D: Second-stage estimates using somatic distance as instrument								
Dependent variable: Aggregated export flows								
DtS trust	0.96** (0.47)	0.74 (0.51)	0.39 (0.44)	0.17 (0.52)	-0.17 (0.57)	0.49 (0.59)	0.50 (0.58)	0.75 (0.58)
<i>Relevance</i>								
K-P rk LM statistic (p-value)	14.65 (0.00)	20.97 (0.00)	17.65 (0.00)	19.93 (0.00)	11.88 (0.00)	16.72 (0.00)	14.74 (0.00)	18.43 (0.00)
<i>Weak identification</i>								
K-P rk Wald statistic	22.99	28.22	27.99	30.45	15.20	27.60	16.50	24.89
R-squared	0.68	0.70	0.72	0.72	0.72	0.71	0.71	0.70
Observations	679	679	679	679	679	679	679	679

Notes: This table presents the coefficients of estimating the first-stage regression (Panel A), the reduced-form equation of the dependent variable (Panel B), the IV coefficients of estimating equation (1) when DtS trust is instrumented with both variables of cultural proximity of country pairs (Panel C) and the IV estimates when instrumenting DtS trust only with a measure of somatic distance (Panel D). In each column, I use an alternative indicator of somatic distance as instrument for bilateral trust. In columns (1) to (4), I use the indicators made available by Guiso et al. (2008a), in columns (5) and (6) the indicators elaborated following the instructions given by them, and in columns (7) and (8) the measures that take the population density into account. The columns are labelled with the letters H, C and S: H stands for height and hair, C for cephalic index and S for skin. The coefficients of the control variables (the same as in Table 2.3) are not reported. Cluster-robust standard errors are reported in parentheses, and the coefficients are statistically different from zero at the ***1%, **5% and *10% level.

of somatic distance employed as instrument for DtS trust. The first four indicators are the ones made available by Guiso et al. (2008a). Column (1) of Panels B, C and D restate the most important results presented in Table 2 (columns (6), (4) and (5), respectively), where the somatic distance measure actually used in GSZ is employed, that is, the sum of the absolute values of the difference in hair colour, height and cephalic index (HHC) of two average citizens living in distinct countries. Column (2) is based on a somatic distance measure that additionally considers the differences in skin colour (HHCS). For column (3), the differences in the cephalic index (HHS) are ignored. The measure used for column (4) sums the absolute differences in hair colour and height (HH). For columns (5) and (6), the measures of somatic distance were constructed following the instructions given in Guiso et al. (2008a), first, trying to replicate the measure actually used by GSZ (column (5))²² and second, disregarding the potentially problematic cephalic index. Finally, the ones used for the last two columns take the distribution of the population within a country into account, first by accounting for the cephalic index (column (7)) and second by disregarding it (column (8)).

According to Panel A of Table 2.4, the first-stage OLS coefficients on the instrumental variables are significantly different from zero in every column, and the point estimates are similar across the various somatic distance measures. Panels C and D present the statistics that give indications of the validity of the instruments. According to these statistics, all the instruments are equally relevant, exogenous and strong. Therefore, one may expect to find similar results in the reduced-form and in the second stage, no matter which somatic distance measure is used. However, this is not the case. When estimating the reduced-form equation (2), according to Panel B, the only significant coefficient on somatic distance is found in column (1), where the original indicator of GSZ is used as instrument. Consequently, the only IV coefficients on DtS trust that are significant in Panel D are the ones instrumented with the somatic distance measure employed by

²²For several country pairs, I did not manage to do so which may explain the diverging results.

GSZ. As soon as alternative measures of somatic distance are employed as instruments (columns (2)–(8)), the significance of the trust coefficients disappears and their magnitude decreases. Column (5) shows the results using the somatic distance measure that was constructed following the instructions of GSZ in the attempt to replicate their results and those in column (1). Although its coefficient is similar to the original indicator at the first stage (compare columns (1) and (5) in Panel A), it enters positively in the reduced-form estimate (Panel B). Moreover, the coefficient on instrumented DtS trust is negative (albeit insignificant) at the second stage (Panel D). This calls for further discussion of the identification strategy and the main results. This additional sensitivity analysis is performed in the next section.

2.3.4 Further Sensitivity Analysis and Discussion

To address the concern that somatic distance might be correlated with cultural and institutional factors that affect international trade (potentially violating the exclusion restriction), dyadic variables were included in the trade regression and it was verified that the results do not suffer from multicollinearity. For instance, it is controlled for linguistic similarities by including an indicator of common official language and a proxy for common linguistic roots based on the language trees provided by the Ethnologue. However, these measures might not be sufficient to appropriately control for linguistic similarity in the context of trade (Isphording and Otten, 2013; Melitz and Toubal, 2014). To address this issue, the measure of common linguistic roots, which was found to be insignificantly related to trade, is replaced by three alternative measures of linguistic similarity suggested by Melitz and Toubal (2014): an indicator of common native language, an indicator of common spoken language, and an indicator of linguistic proximity between different native languages.²³ These language measures are slightly correlated with the somatic

²³Melitz and Toubal (2014) emphasise that a measure of common linguistic roots based on the language trees provided by the Ethnologue is problematic, as it does not allow the comparison of languages that belong to different trees.

distance indicators, but when simultaneously including all four in the trade equation, the reduced-form and IV estimates are almost identical to the ones presented in Table 2.4, again suggesting that DtS trust does not affect international trade.²⁴

Table 2.5: Effects of lagged DtS trust on international trade

	HHC (1)	Guiso et al. (2008a)			Replication		Pop. D	
		HH (2)	HHCS (3)	HHS (4)	HHC (5)	HH (6)	HHC (7)	HH (8)
Panel A: DtS trust lagged two years								
DtS trust	0.79* (0.45)	0.63 (0.51)	0.25 (0.44)	0.08 (0.53)	-0.35 (0.58)	0.40 (0.60)	0.31 (0.58)	0.60 (0.59)
<i>Relevance</i>								
K-P rk LM statistic (p-value)	14.65 (0.00)	20.97 (0.00)	17.65 (0.00)	19.93 (0.00)	11.88 (0.00)	16.72 (0.00)	14.74 (0.00)	18.43 (0.00)
<i>Weak identification</i>								
K-P rk Wald statistic	22.99	28.22	27.99	30.45	15.20	27.60	16.50	24.89
Panel B: DtS trust lagged four years								
DtS trust	0.80* (0.44)	0.72 (0.51)	0.31 (0.43)	0.21 (0.53)	-0.31 (0.56)	0.58 (0.60)	0.39 (0.58)	0.79 (0.60)
<i>Relevance</i>								
K-P rk LM statistic (p-value)	14.65 (0.00)	20.97 (0.00)	17.65 (0.00)	19.93 (0.00)	11.88 (0.00)	16.72 (0.00)	14.74 (0.00)	18.43 (0.00)
<i>Weak identification</i>								
K-P rk Wald statistic	22.99	28.22	27.99	30.45	15.2	27.6	16.5	24.89
Observations	679	679	679	679	679	679	679	679

Notes. This table presents the coefficients of regressing international trade on bilateral trust lagged by two years (Panel A) and by four years (Panel B). In each column, alternative indicators of somatic distance are used as instruments for bilateral trust. In columns (1) to (4) the indicators employed are the ones made available by Guiso et al. (2008a), columns (5) and (6) employ indicators elaborated following the instructions given by them, and columns (7) and (8) use the measures that take the population density into account. The columns are labelled with the letters H, C and S: H stands for height and hair, C for cephalic index and S for skin. The coefficients of the control variables (the same as in Table 2.3) are not reported. All estimations include control variables and full sets of source- and country-year fixed effects. Cluster-robust standard errors are reported in parentheses and the coefficients are statistically different from zero at the ***1%, **5%, and *10% level.

Another concern may be that bilateral trust across countries does not affect international trade flows contemporaneously but with a lag. Therefore, the 2SLS procedure is re-estimated by allowing instrumented trust to affect trade flows two years and four years later. The results of these estimations are reported in Panel A and Panel B of Table 2.5, respectively. Reduced-form estimates and the results in which the various somatic distance indicators are employed as (sole) instruments are again basically unchanged.

²⁴The regression results and the correlations are reported in the appendix.

Finally, the sample is enlarged by including non-European countries—such as Switzerland—for which data availability is sufficient. Even when sticking to the somatic distance indicator used by GSZ, the coefficient on instrumented DtS trust at the second stage is insignificant, like the OLS estimate (results not reported).

In sum, DtS trust does not remain significant in the trade regression when instrumented with alternative measures of somatic distance that are as equally valid as the one employed by GSZ. According to GSZ (p. 1120), “it is possible that - test of overidentifying restrictions notwithstanding - our instruments are not orthogonal to trade, but pick up a set of cultural, institutional, and legal connections that facilitate trade flows. [...] If this is the case, our results suggest the importance of culture-specific factors in trade relationships”. However, according to our reduced-form estimates, neither religious similarity nor the alternative somatic distance indicators considered in addition to the one discussed by GSZ affect trade. In other words, neither bilateral trust nor possible institutional and cultural factors picked up by their instrumentation strategy seem to causally affect trade. This result does not change when additional controls are included in the trade regression or when it is allowed for lags in the trust-trade relationship. Thus, contrary to their conclusion, no robust evidence is found using the approach suggested by GSZ, namely that bilateral trust and/or cultural proximity—apart from common language indicators—causally affect international trade.

2.4 Bilateral Trust and International Migration

As stated in the introduction, there are reasons to suspect that bilateral trust affects international migration. StD trust might influence the way expectations about the costs and benefits of moving abroad are shaped while DtS trust may, for example, affect immigration policies in the destination countries. The econometric model used is similar to (2.1), with migration flows rather than trade flows as the dependent variable, but less

standard. Therefore, the estimated equation is derived in a structural way by presenting a Roy model that heavily draws on recent contributions by Ortega and Peri (2013) and Bertoli and Moraga (2013).

2.4.1 Structural Model and Data

Consider an individual i born in country s . Suppose that the utility from staying in s , denoted by U_{ss}^i , and moving to country $d \neq s$, U_{sd}^i , can be additively decomposed into a component that is common for all individuals in country s (V_{ss} , V_{sd}), and a component that is location- and individual-specific (θ_{ss}^i , θ_{sd}^i):

$$U_{sj}^i = V_{sj} + \theta_{sj}^i, j \in \{d, s\}. \quad (2.4)$$

Suppose that we do not observe the individual-specific components but know that θ_{ss}^i and θ_{sd}^i , $d \neq s$, are all identically and independently type-I extreme value distributed with no correlation between θ_{ss}^i and θ_{sd}^i , $d \neq s$, but correlation among the terms θ_{sd}^i , $d \neq s$. Allowing for correlation among the individual-specific terms of all potential destination countries accounts for unobserved individual heterogeneity which captures that migrants could be a selected group and have correlated utility within destination countries. It relaxes the assumption of independence of irrelevant alternatives previously applied in the migration literature (e.g. Beine et al., 2011; Grogger and Hanson, 2011). In the language of a nested logit model (McFadden, 1978), all destination countries are assumed to belong to the same nest.²⁵ Considering the now standard Generalized Extreme Value generating function (McFadden, 1978), the probability of observing that an individual i born in country s does not migrate can be written as

$$p_s = \frac{e^{V_{ss}}}{e^{V_{ss}} + \left(\sum_{d \neq s} e^{V_{sd}/\tau} \right)^\tau}, \quad (2.5)$$

²⁵This is a special case of Bertoli and Moraga (2013) that was proposed by Ortega and Peri (2013).

where $1 - \tau$ captures the correlation among the terms θ_{sd}^i , $d \neq s$. The probability of migrating to $d \neq s$ reads as

$$p_d = \frac{e^{V_{sd}/\tau} \left(\sum_{d \neq s} e^{V_{sd}/\tau} \right)^{\tau-1}}{e^{V_{ss}} + \left(\sum_{d \neq s} e^{V_{sd}/\tau} \right)^{\tau}}. \quad (2.6)$$

Thus, the log of the relative probability of staying and migrating is given by

$$\log \left(\frac{p_s}{p_d} \right) = V_{ss} - \frac{V_{sd}}{\tau} + z_s, \quad (2.7)$$

where $z_s \equiv (1 - \tau) \log(\sum_{d \neq s} e^{V_{sd}/\tau})$. Let us approximate p_s/p_d by the observed number of stayers in s , n_s , relative to the number (flow) of migrants to $d \neq s$, mig_{sd} ; that is, $p_s/p_d \approx n_s/mig_{sd}$. Taking logs, I obtain

$$\log \left(\frac{p_s}{p_d} \right) = \log(n_s) - \log(mig_{sd}) + \epsilon_{sd}, \quad d \neq s, \quad (2.8)$$

where term ϵ_{sd} captures the error of approximating probabilities (Ortega and Peri, 2013).

Combining the right-hand sides of (2.7) and (2.8) and adding time index t implies

$$\log(mig_{sdt}) = \frac{V_{sdt}}{\tau} + \lambda_{st} + \epsilon_{sdt}, \quad (2.9)$$

where $\lambda_{st} \equiv \log(n_{st}) - V_{sst} - z_{st}$ is captured with time-dependent source-country dummies. Let the observable utility component V_{sdt} of a migrant moving from s to d in period t additively depend on bilateral (StD or DtS) trust, the difference in the log of per capita income across countries, time-invariant differences between s and d , and time-varying characteristics of the destination country captured by a time-dependent destination-country fixed effect.²⁶ Indicators of StD trust and DtS trust cannot be simultaneously included in the estimated equation because they turn out being highly correlated. These theoretical

²⁶Ortega and Peri (2013) do not allow for destination-country fixed effects to vary over time.

considerations then suggest the following two specifications:

$$\log(mig_{sdt}) = \alpha_0 + \alpha_1 trust_{sdt} + \alpha_2 \Delta GDP_{sdt} + \mathbf{X}'_{sd} \gamma + \lambda_{dt} + \lambda_{st} + \epsilon_{sdt}, \quad (2.10)$$

$$\log(mig_{sdt}) = \beta_0 + \beta_1 trust_{dst} + \beta_2 \Delta GDP_{sdt} + \mathbf{X}'_{sd} \rho + \lambda_{dt} + \lambda_{st} + e_{sdt}, \quad (2.11)$$

where the dependent variable, denoted by $\log(mig_{sdt})$, is the natural logarithm of the (gross) immigration flows from country-of-origin s to country-of-destination d in period t , $trust_{sdt}$ and $trust_{dst}$ stand for the StD and DtS trust observed in year t , respectively and ΔGDP_{sdt} measures the percentage difference in the gross domestic product (GDP) per capita of the two countries. This variable is used as a proxy for the wage differential between a country pair suspected to affect international labour migration. \mathbf{X}'_{sd} is a vector of bilateral time-invariant variables, λ_{st} and λ_{dt} are country-year fixed effects, and ϵ_{sdt} and e_{sdt} are mean-zero random variables.

To estimate these specifications, I use data on immigration flows collected by Ortega and Peri (2011, 2009) for the dependent variable. They merged and harmonised data sets gathered by Mayda (2010), the United Nations and the OECD (International Migration Database) to establish an unbalanced panel of annual data on bilateral gross immigration flows into 30 OECD countries from 1946 to 2008. This unique dataset details the legal entry of foreign citizens who wish to be residents in an OECD country. Consistency is ensured by verifying that immigrants are always defined on the same basis across the database for each destination country.²⁷ The other variables are identical to the ones used in Tables 2.3 and 2.4. Regarding geographical distance, only the measure provided by Mayer and Zignago (2011) is employed.

²⁷To complete the dataset, Ortega and Peri (2011, 2009) interpolate observations when the missing value is situated between two years for which the observations are available and compute the net immigration flows. They correct for the outflow of foreign citizens using the International Migration Database and the dataset on emigration stocks for the years 1990 and 2000 collected by Docquier, Lowell and Marfouk (2007). However, these net immigration flows are less precise than the gross flows and only have a limited coverage.

2.4.2 Results

Panel B of Table 2.1 reports the summary statistics of the sample used to analyse the relationship between international migration and StD trust, and Panel C those used to analyse the effect of international migration on DtS trust. The number of observations varies across panels because of missing data. The analysis again focuses on observations for European countries in the years for which data on bilateral trust is available.

Basic Estimates

The results of estimating equations (2.10) and (2.11) are shown in Tables 2.6 and 2.7, respectively. The first three columns present standard OLS estimates. They suggest that a 1 percent increase in the difference in GDP per capita increases immigration flows on average by approximately 2 percent. This positive and significant effect is in line with the notion, typically supported by the data, that international wage differentials affect migration patterns. Moreover, geographical distance between countries has a significant and negative effect on the dependent variables, while sharing legal origins has a positive effect.

The main finding from columns (1)–(3) is the absence of a significant correlation between bilateral trust and immigration flows. In column (1) of Table 2.6, the coefficient on StD trust is positive but rather small and not significantly different from zero. In column (2), an indicator of the existing diaspora in the destination countries is included. Beine et al. (2011) showed that an increase in the past stock of migrants in a country increases migration flows, possibly because a larger diaspora reduces the costs and risks migrants face when moving abroad. Such network effects are captured with a proxy for the emigration stocks in 1960, as employed in Grossmann and Stadelmann (2013). This variable ensures a lag of at least 10 years that exists between the proxy and the other observations included in our regression. It is itself significant and positive, as found in

Table 2.6: Bilateral migration flows and StD trust

	OLS (1)	OLS (2)	OLS (3)	IV-SR (4)	IV-S (5)	RF (6)
Trust (StD)	0.68 (0.59)	0.43 (0.60)	0.23 (0.65)	2.22** (0.93)	2.40 (1.51)	
Diff. in GDP p.c. (%)	1.66* (0.86)	2.07** (0.87)	1.93** (0.84)	2.50** (0.96)	2.55** (1.02)	2.01** (0.84)
Common language	-0.24 (0.34)	-0.36 (0.33)	-0.27 (0.33)	-0.41 (0.28)	-0.42 (0.29)	-0.25 (0.35)
Weighted distance (log)	-0.70** (0.31)	-0.57* (0.30)	-0.55* (0.30)	-0.41 (0.27)	-0.41 (0.29)	-0.47 (0.30)
Common border	0.00 (0.34)	0.26 (0.38)	0.21 (0.38)	0.30 (0.30)	0.30 (0.29)	0.23 (0.37)
Same legal origin	0.61*** (0.24)	0.69*** (0.23)	0.52* (0.27)	0.54*** (0.20)	0.56** (0.22)	0.53** (0.26)
Mig. Stock 1960 (log)		0.33* (0.18)	0.30* (0.17)	0.24 (0.15)	0.23 (0.16)	0.32* (0.17)
Religious similarity			0.50 (0.46)		-0.08 (0.56)	0.43 (0.39)
Somatic distance (GSZ)						-0.09 (0.07)
<i>Relevance</i>						
K-P rk LM statistic (p-value)				21.61 (0.00)	13.99 (0.00)	
<i>Weak identification</i>						
K-P rk Wald statistic				14.41	12.37	
<i>Over-identification</i>						
Hansen J-statistic (p-value)				0.02 (0.88)		
Observations	450	450	450	450	450	450
R-squared	0.89	0.89	0.89			0.89

Notes: The dependent variable is the natural logarithm of migration flows from country s to country d (Ortega and Peri, 2011, 2009). Trust (StD) measures the average trust that citizens in country s grant citizens in country d (Eurobarometer surveys). Somatic distance is the measure used by GSZ that sums the absolute value of the difference in hair colour, height, and cephalic index. All equations include country-year dummies. The estimated robust standard errors reported in parentheses are clustered at the country pair. Coefficients are statistically different from zero at the ***1%, **5% and *10% level. Columns (1)–(3) present OLS estimates; columns (4) and (5) present IV estimates with somatic distance and religious similarity as instruments (IV-SR) and with somatic distance as the only instrument (IV-S), respectively. RF (column (6)) refers to the reduced-form equation of the dependent variables.

previous studies. Adding it decreases the coefficient of StD trust, which is still statistically insignificant. The same pattern is observed when including religious similarity as control variable in column (3): it halves the coefficient of StD trust and slightly increases its standard error. The OLS estimates thus suggest that StD trust is not significantly related to international migration.

Next, again, the IV estimation proposed by GSZ is applied, and a sensitivity analysis is performed to examine whether the IV results follow a similar pattern in the migration setting as they did in the trade setting. Using the somatic distance measure as employed by GSZ and religious similarity as instruments, the coefficient on StD trust strongly increases compared to the OLS estimates and becomes significantly different from zero at the five percent level (column (4)). The employed instruments pass the Hansen J-test. The Kleibergen-Paap rk statistics suggest that they are relevant and strong. Nevertheless, like for Table 2.3, there are several reasons to regard the results in column (4) with caution. First, the IV estimate on StD trust is five times larger than the OLS counterpart. This suggests that an increase in StD trust of one standard deviation increases gross immigration flows on average by 66 percent, which is a surprisingly large effect in view of the OLS estimate. Second, there is again plenty of reason to believe that religious similarity may affect international migration not exclusively through the trust channel (see also Chapter 4). It rather may shape institutional differences related to international labour mobility or be affected by migration flows themselves, as these potentially change the composition of the population in many respects. Finally, the previous section suggests that the coefficient on bilateral trust might not be robust to the use of alternative measures of somatic distance as instruments.

To address these concerns, an alternative specification that does not exclude the proxy for religious similarity as an explanatory variable in the migration equation is estimated. Column (5) reports the results when the sole indicator of somatic distance employed as instrumental variable for bilateral trust is the one used by GSZ. The IV coefficient on StD

trust is similar in magnitude to that in column (4), but it loses its significance. Column (6) shows the results of estimating a reduced-form equation analogously to equation (2.3). The results suggest that neither somatic distance nor religious similarity are partially correlated with international migration in the reduced-form. This absence of a correlation between the instrumental variables and the dependent variable, as well as the insignificant coefficients found in columns (1)–(3), raise doubts about the hypothesis that StD trust affects the decision of potential migrants to move abroad.

According to Table 2.7, the relationship between DtS trust and international migration is similar to the one observed in Table 2.6 between StD trust and international migration. In columns (1)–(3), the OLS estimates of the coefficient of DtS trust are positive but not statistically significant. Instrumenting DtS trust with indicators of religious similarity and somatic distance in column (4) yields significant results, here at the 10 percent level, that are more than five times larger than their OLS counterparts. They suggest that an increase of DtS trust of one standard deviation increases immigration flows on average by 56 percent. However, according to column (5), when including religious similarity at the second stage rather than using it as an instrument for DtS trust, the coefficient on DtS trust becomes insignificant. Moreover, also similar to Table 2.6, column (6) in Table 2.7 shows that the correlation between the instruments and international migration is again insignificant when estimated in the reduced form.

(Lack of) Robustness

In view of these inconclusive results with respect to the relationship between bilateral trust and international migration, I again exploit the fact that there is a large degree of freedom in defining the concept of somatic distance and estimate regressions (2.10) and (2.11) with the same covariates and the same sample again, changing only the somatic distance indicator used as the instrument. The results of this analysis are reported in Table 2.8 for the relationship between international migration and StD trust and in Table

Table 2.7: Bilateral migration flows and DtS trust

	OLS (1)	OLS (2)	OLS (3)	IV-SR (4)	IV-S (5)	RF (6)
Trust (DtS)	0.62 (0.57)	0.33 (0.60)	0.22 (0.62)	1.78* (0.99)	1.53 (1.02)	
Diff. in GDP p.c. (%)	1.64* (0.84)	2.05** (0.84)	1.97** (0.82)	2.01** (0.78)	2.05*** (0.76)	2.10** (0.81)
Common language	-0.15 (0.35)	-0.30 (0.34)	-0.22 (0.34)	-0.18 (0.29)	-0.19 (0.29)	-0.22 (0.36)
Weighted distance (log)	-0.73** (0.31)	-0.61** (0.30)	-0.58* (0.29)	-0.51* (0.27)	-0.52** (0.26)	-0.50 (0.31)
Common border	-0.04 (0.33)	0.23 (0.39)	0.19 (0.39)	0.15 (0.28)	0.14 (0.29)	0.22 (0.37)
Same legal origin	0.57** (0.25)	0.65*** (0.23)	0.49* (0.27)	0.51** (0.21)	0.47** (0.22)	0.51* (0.26)
Mig. Stock 1960 (log)		0.31* (0.17)	0.28 (0.18)	0.18 (0.16)	0.20 (0.16)	0.30* (0.17)
Religious similarity			0.46 (0.39)		0.25 (0.33)	0.36 (0.39)
Somatic distance (GSZ)						-0.08 (0.06)
<i>Relevance</i>						
K-P rk LM statistic (p-value)				13.93 (0.00)	11.09 (0.00)	
<i>Weak identification</i>						
K-P rk Wald statistic				15.05	20.49	
<i>Over-identification</i>						
Hansen J-statistic (p-value)				0.60 (0.44)		
Observations	463	463	463	463	463	463
R-squared	0.89	0.89	0.89			0.90

Notes: The dependent variable is the natural logarithm of the migration flows from country s to country d (Ortega and Peri, 2009, 2011). Trust (DtS) measures the average trust that citizens in country d grant citizens in country s (Eurobarometer surveys). Somatic distance is the measure used by GSZ that sums the absolute value of the differences in hair colour, height and cephalic index. All equations include country-year dummies. Robust standard errors are reported in parentheses, which are clustered at the country pair. Coefficients are statistically different from zero at the ***1%, **5% and *10% level. Columns (1)–(3) present OLS estimates; columns (4) and (5) present IV estimates with somatic distance and religious similarity as instruments (IV-SR) and with somatic distance as the only instrument (IV-S), respectively. RF (column (6)) refers to the reduced-form equation of the dependent variables (see appendix).

2.9 for its relationship with DtS trust.

Table 2.8: Migration: Instrumenting StD trust with various measures of somatic distance

	Guiso et al. (2008a)				Replication		Pop. Density	
	HHC	HH	HHCS	HHS	HHC	HH	HHC	HH
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: First-stage regression								
Dependent variable: source-to-destination trust								
Somatic distance	-0.04*** (0.01)	-0.06*** (0.01)	-0.04*** (0.01)	-0.05*** (0.01)	-0.03** (0.01)	-0.06*** (0.01)	-0.04*** (0.01)	-0.06*** (0.01)
Religious similarity	0.21*** (0.07)	0.18*** (0.06)	0.21*** (0.07)	0.18*** (0.06)	0.21*** (0.08)	0.16** (0.07)	0.20*** (0.07)	0.17** (0.07)
Panel B: Reduced-form equation of international migration								
Dependent variable: international immigration flows								
Somatic distance	-0.09 (0.07)	-0.09 (0.08)	0.01 (0.06)	0.03 (0.08)	0.01 (0.07)	-0.02 (0.10)	-0.08 (0.07)	-0.07 (0.09)
Religious similarity	0.43 (0.39)	0.41 (0.40)	0.58 (0.43)	0.60 (0.45)	0.58 (0.45)	0.53 (0.46)	0.42 (0.40)	0.44 (0.41)
Panel C: Second-stage estimates using somatic distance and religious similarity as instruments								
Dependent variable: international immigration flows								
StD trust	2.22** (0.93)	1.84** (0.80)	0.95 (0.83)	0.83 (0.79)	1.27 (0.85)	1.25 (0.81)	2.00** (0.89)	1.71* (0.82)
<i>Relevance</i>								
K-P rk LM statistic	21.61 (0.00)	25.88 (0.00)	24.39 (0.00)	26.94 (0.00)	21.68 (0.00)	24.99 (0.00)	20.80 (0.00)	24.69 (0.00)
<i>Weak identification</i>								
K-P rk Wald statistic	14.41	16.10	18.64	19.19	12.54	17.59	14.74	17.68
<i>Exogeneity</i>								
Hansen J-statistic	0.02 (0.88)	0.07 (0.80)	1.79 (0.18)	2.12 (0.15)	0.90 (0.34)	0.90 (0.34)	0.01 (0.93)	0.17 (0.68)
Panel D: Second-stage estimates using somatic distance as instrument								
Dependent variable: International immigration flows								
StD trust	2.40 (1.51)	1.60 (1.23)	-0.33 (1.30)	-0.47 (1.23)	-0.36 (1.79)	0.24 (1.36)	1.89 (1.50)	1.28 (1.33)
<i>Relevance</i>								
K-P rk LM statistic	13.99 (0.00)	22.52 (0.00)	20.47 (0.00)	23.71 (0.00)	8.23 (0.00)	17.72 (0.00)	17.50 (0.00)	19.50 (0.00)
<i>Weak identification</i>								
K-P rk Wald statistic	12.37	18.11	19.65	23.80	5.54	18.62	12.85	19.30
Observations	450	450	450	450	450	450	450	450

Notes. This table presents the coefficients of estimating the first-stage regression (Panel A), the reduced-form equation of the dependent variable (Panel B), the IV coefficients of estimating equation 2.10 when StD trust is instrumented with both variables of cultural proximity of country pairs (Panel C) and the IV estimates when instrumenting StD trust only with a measure of somatic distance (Panel D). In each column, alternative indicators of somatic distance are used as instruments for bilateral trust. In columns (1) to (4), the employed indicators are the ones made available by GSZ, in columns (5) and (6) the indicators are elaborated following the instructions given by Guiso et al. (2008a) and in columns (7) and (8) the measures take the population density into account. The columns are labelled with the letters H, C and S: H stands for height and hair, C for cephalic inde, and S for skin. The coefficients of the control variables (the same as in Table 2.6) are not reported. Cluster-robust standard errors are reported in parentheses and the coefficients are statistically different from zero at the ***1%, **5% and *10% level.

In column (1) of Panels B, C and D of Table 2.8, the most important results of Panel A in Table 2.6 are restated (columns (6), (4) and (5), respectively). Panel A of Table 2.8 additionally reports the first-stage coefficients on somatic distance and religious similarity when StD trust is regressed on all included and excluded exogenous variables. As in the case where international trade flows are the dependent variable at the second stage, various measures of somatic distance are equally significant at the first stage, and the coefficients are similar across the different columns. However, none of these indicators are correlated with international migration in the reduced-form equation (Panel B).

Panel C shows the second-stage results for the case where the eight measures of somatic distance are used as instruments jointly with religious similarity. Whereas second-stage estimates for the coefficients on StD trust are significant in columns (1), (2), (7) and (8), they are insignificant in the other columns. Given the particularly questionable validity of religious similarity as instrumental variable for bilateral trust, Panel D reports the trust coefficients when instrumenting StD trust solely with the measures of somatic distance (again not excluding religious similarity in the second-stage estimates). Consistent with the results found in Panel B, none of the estimations yield statistically significant coefficients, and some even have a negative sign.

Regarding the effect of DtS trust on migration, Table 2.9 provides a sensitivity analysis of the results presented in Table 2.7. Column (1) of Panels B, C and D of Table 2.9 restate the most important results. According to Panel A of Table 2.9, all indicators of somatic distance significantly affect DtS trust at the five percent level. However, again, none of them are correlated with international migration in the reduced-form equation (Panel B). Panel C reports the IV estimates when using somatic distance and religious similarity as instruments for DtS trust. Analogously to the results found in Panel C of Table 2.8, the statistical tests suggest that the instruments are relevant and exogenous. Moreover, the coefficients on instrumented DtS trust are sometimes significant at the second stage. However, according to Panel A, as repeatedly mentioned, the indicator of

religious similarity is not significantly correlated with DtS trust and is thus a potentially problematic instrument. Panel D of Table 2.9 shows the second-stage estimates when instrumenting DtS trust with the various measures of somatic distance as sole instruments. Consistent with the reduced-form results in Panel B, the coefficients on instrumented DtS trust are all statistically insignificant and, analogously to Panel D of Table 2.8, sometimes even negative.

Discussion of Results

Overall, the results in Tables 2.6 to 2.9 suggest that neither StD nor DtS trust play a robust role in international migration flows. In particular, all measures of somatic distance are irrelevant in the reduced-form estimates, and the instrumented trust measures are insignificant if religious similarity is not excluded at the second stage. Thus, analogously to international trade, there is no convincing evidence that bilateral trust and/or cultural proximity as measured by religious similarity and somatic distance are important determinants of international migration.

2.5 Conclusion

This chapter has examined the causal impact of average bilateral trust across countries on bilateral international trade and migration flows. First, the identification strategy of GSZ was applied, that is, an indicator of religious similarity and a measure of somatic distance between country pairs were used as instrumental variables for bilateral trust. Next, a sensitivity analysis was added when investigating the determinants of international trade and, for the first time, the relationship between bilateral trust and international migration. In contrast to GSZ, the specifications preferred in this chapter included religious similarity as a covariate in the second stage of the 2SLS procedure and instrumented bilateral trust only with an indicator of somatic distance. Seven different

Table 2.9: Migration: Instrumenting DtS trust with various measures of somatic distance

	Guiso et al. (2008a)			Replication		Pop. Density		
	HHC	HH	HHCS	HHS	HHC	HH	HHC	HH
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: First-stage regression								
Dependent variable: destination-to-source trust								
Somatic distance	-0.06***	-0.06***	-0.05***	-0.05***	-0.05***	-0.06***	-0.06***	-0.05***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)
Religious similarity	0.07	0.06	0.08	0.07	0.08	0.06	0.06	0.06
	(0.07)	(0.07)	(0.07)	(0.07)	(0.08)	(0.08)	(0.07)	(0.07)
Panel B: reduced-form equation of international migration								
Dependent variable: international immigration flows								
Somatic distance	-0.08	-0.08	0.02	0.03	0.01	-0.00	-0.08	-0.06
	(0.06)	(0.08)	(0.06)	(0.08)	(0.07)	(0.10)	(0.07)	(0.08)
Religious similarity	0.36	0.36	0.52	0.55	0.51	0.49	0.35	0.39
	(0.39)	(0.40)	(0.42)	(0.44)	(0.45)	(0.46)	(0.39)	(0.41)
Panel C: Second-stage estimates using somatic distance and religious similarity as instruments								
Dependent variable: international immigration flows								
DtS trust	1.78*	1.77*	0.29	0.39	0.77	1.13	1.64*	1.63
	(0.99)	(1.06)	(0.89)	(1.02)	(0.98)	(1.19)	(1.00)	(1.17)
<i>Relevance</i>								
K-P rk LM statistic	13.93	15.21	13.88	14.52	13.15	11.70	15.97	13.97
(p-value)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
<i>Weak identification</i>								
K-P rk Wald statistic	15.05	11.37	14.19	10.10	13.23	8.62	14.73	10.10
<i>Exogeneity</i>								
Hansen J-statistic	0.60	0.65	2.50	2.48	1.88	1.59	0.74	0.88
(p-value)	(0.44)	(0.42)	(0.11)	(0.12)	(0.17)	(0.21)	(0.39)	(0.35)
Panel D: Second-stage estimates using somatic distance as instrument								
Dependent variable: international immigration flows								
DtS trust	1.53	1.39	-0.37	-0.65	-0.29	0.05	1.40	1.06
	(1.02)	(1.16)	(1.03)	(1.29)	(1.29)	(1.52)	(1.05)	(1.33)
<i>Relevance</i>								
K-P rk LM statistic	11.09	13.19	11.82	13.10	7.83	8.44	12.79	10.71
(p-value)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)
<i>Weak identification</i>								
K-P rk Wald statistic	20.49	17.22	22.35	16.22	14.61	10.73	23.49	14.29
Observations	463	463	463	463	463	463	463	463

Notes. This table presents the coefficients of estimating the first-stage regression (Panel A), the reduced-form equation of the dependent variable (Panel B), the IV coefficients of estimating equation 2.11 when DtS trust is instrumented with both variables of cultural proximity of country pairs (Panel C), and the IV estimates when instrumenting DtS trust only with a measure of somatic distance (Panel D). In each column, an alternative indicator of somatic distance is used as instrument for bilateral trust. In columns (1) to (4), the indicators employed is the one made available by GSZ, in columns (5) and (6) the indicators are elaborated following the instructions given by Guiso et al. (2008a) and in columns (7) and (8) the measures take the population density into account. The columns are labelled with the letters H, C and S: H stands for height and hair, C for cephalic index and S for skin. The coefficients of the control variables (the same as in Table 2.7) are not reported. Cluster-robust standard errors are reported in parentheses and the coefficients are statistically different from zero at the ***1%, **5% and *10% level.

indicators of somatic distance (based on different weighting of physical attributes) were constructed and employed in addition to the one used by GSZ. These alternative somatic

distance indicators appeared to be all equally valid and strong instruments. Nevertheless, in the context of international trade, the estimated coefficient on DtS trust was only significantly different from zero when it was instrumented with the sole measure of somatic distance employed by GSZ. In the migration regression, neither coefficients of StD trust nor DtS trust are ever significant. Moreover, when estimating the reduced equation—where trade and migration are regressed on the instruments in addition to the explanatory variables—neither the coefficients on religious similarity nor the ones of the various somatic distance indicators were statistically different from zero. The only exception was found in the trade context when the somatic distance indicator by GSZ was used. In summary, whereas GSZ concluded that their “results suggest that cultural relationships affect trust and are an important omitted factor in international trade” (p. 1098), the sensitivity analysis performed in this chapter does not provide robust evidence for the hypotheses that bilateral trust across countries and/or cultural proximity—apart from language—affect international trade or migration patterns.

Of course, it is possible that the measure of average trust that citizens from one country place in those from another country, as elicited from the employed Eurobarometer surveys, is not an appropriate measure of bilateral trust in the context of trade and migration. I therefore do not go as far as to challenge the view of Arrow (1972, p. 357), who pointed out that “Virtually every commercial transaction has within itself an element of trust, certainly any transaction conducted over a period of time. It can be plausibly argued that much of the economic backwardness in the world can be explained by the lack of mutual confidence.” Moreover, the potential validity problems of the employed instruments were not fully solved. Future research shall thus attempt to develop and apply alternative identification strategies to those used by GSZ. A fruitful guidance is the quasi-experimental approach in Egger and Lassmann (2013), who employ data about the trade of different language regions in Switzerland with neighbouring countries to deal better with within-country heterogeneity and to draw more convincing inferences about

causal effects.

Appendix to Chapter 2

Table A.1
Correlation coefficients between time-invariant variables

	Guiso et al. (2008a)				Replication		Pop. Density		Meltz and Toubal (2014)				PC			
	HHCS	HHC	HHS	HH	HHC	HH	HHC	HH	COL	CSL	CNL	LP	RS	CLO	CB	TC
Somatic Distance																
<i>Guiso et al. (2008a)</i>																
HHCS	1															
HHC	0.93	1														
HHS	0.88	0.76	1													
HH	0.81	0.84	0.93	1												
<i>Replication</i>																
HHC	0.73	0.72	0.65	0.65	1											
HH	0.73	0.71	0.80	0.81	0.82	1										
<i>Pop. Density</i>																
HHC	0.78	0.74	0.76	0.74	0.79	0.81	1									
HH	0.77	0.73	0.87	0.88	0.76	0.92	0.88	1								
Explanatory Variables																
Common Official Language (COL)	-0.33	-0.27	-0.28	-0.21	-0.30	-0.20	-0.24	-0.23	1							
Common Spoken Language (CSL)	-0.25	-0.03	-0.25	-0.01	-0.31	-0.17	-0.29	-0.22	0.47	1						
Common Native Language (CNL)	-0.26	-0.22	-0.16	-0.10	-0.29	-0.21	-0.18	-0.20	0.74	0.45	1					
Linguistic Proximity (LP)	-0.33	-0.21	-0.47	-0.38	-0.36	-0.47	-0.44	-0.50	-0.22	0.24	-0.34	1				
Press Coverage (PC)	-0.15	-0.10	-0.17	-0.12	-0.18	-0.21	-0.19	-0.18	0.35	0.16	0.49	-0.08	1			
Weighted Distance (DIST)	0.43	0.24	0.41	0.21	0.37	0.31	0.45	0.32	-0.53	-0.69	-0.42	-0.29	-0.67	1		
Linguistic Common Roots (LCR)	-0.44	-0.39	-0.50	-0.47	-0.45	-0.51	-0.48	-0.54	0.51	0.41	0.43	0.43	0.78	-0.59	1	
Religious Similarity (RS)	-0.27	-0.31	-0.35	-0.43	-0.22	-0.39	-0.22	-0.34	0.01	-0.09	-0.06	0.32	0.26	-0.15	0.33	1
Common Legal Origin (CLO)	-0.41	-0.50	-0.38	-0.48	-0.35	-0.50	-0.37	-0.47	0.25	-0.16	0.35	-0.01	0.25	-0.10	0.44	0.32
Common Border (CB)	-0.42	-0.39	-0.38	-0.35	-0.47	-0.36	-0.41	-0.35	0.58	0.30	0.46	0.06	0.50	-0.61	0.46	0.16
Transportation Costs (TC)	0.31	0.15	0.32	0.16	0.21	0.26	0.35	0.24	-0.36	-0.50	-0.27	-0.31	-0.54	0.89	-0.50	-0.28
																0.29
																1
																-0.49

Notes : This table presents the correlation coefficients between the time-invariant variables included in Chapter 2.

Table A.2
Regressing linguistic common roots on bilateral variables, varying the somatic distance indicator

	Guiso et al. (2008a)				Replication		Pop. Density	
	HHCS	HHC	HHS	HH	HHC	HH	HHC	HH
Somatic distance	-0.00 (0.01)	-0.03*** (0.01)	-0.00 (0.00)	-0.02*** (0.01)	-0.02*** (0.01)	-0.04*** (0.01)	-0.02*** (0.01)	-0.05*** (0.01)
Common language	0.15*** (0.03)	0.15*** (0.02)	0.15*** (0.03)	0.15*** (0.03)	0.15*** (0.03)	0.16*** (0.03)	0.16*** (0.03)	0.16*** (0.02)
Weighted distance (log)	-0.23*** (0.03)	-0.20*** (0.03)	-0.23*** (0.03)	-0.20*** (0.03)	-0.20*** (0.03)	-0.19*** (0.03)	-0.19*** (0.03)	-0.17*** (0.03)
Religious similarity	0.16*** (0.02)	0.11*** (0.02)	0.16*** (0.02)	0.13*** (0.02)	0.14*** (0.02)	0.12*** (0.02)	0.15*** (0.02)	0.12*** (0.02)
Same legal origin	0.13*** (0.01)	0.11*** (0.01)	0.13*** (0.01)	0.12*** (0.01)	0.12*** (0.01)	0.10*** (0.01)	0.12*** (0.01)	0.09*** (0.01)
Common border	-0.03 (0.02)	-0.04** (0.02)	-0.02 (0.02)	-0.03 (0.02)	-0.04** (0.02)	-0.03* (0.02)	-0.03* (0.02)	-0.03* (0.02)
Transportation costs (log)	0.49*** (0.19)	0.31* (0.18)	0.51*** (0.19)	0.37** (0.18)	0.30 (0.19)	0.32* (0.18)	0.37** (0.18)	0.22 (0.18)
Press coverage	-0.17 (0.13)	-0.14 (0.13)	-0.19 (0.13)	-0.15 (0.13)	-0.16 (0.13)	-0.19 (0.13)	-0.15 (0.13)	-0.17 (0.12)
Observations	679	679	679	679	679	679	679	679
R-squared	0.55	0.57	0.55	0.56	0.56	0.57	0.56	0.58

Notes : The estimated standard errors reported in brackets are statistically different from zero at the ***1%, **5%, and *10% level.

Table A.3
DtS trust and international trade: LIML

	Guiso et al. (2008a)				Replication		Pop. Density	
	HHC (1)	HH (2)	HHCS (3)	HHS (4)	HHC (5)	HH (6)	HHC (7)	HH (8)
Panel A: Second-stage estimates using somatic distance and religious similarity as instruments								
<i>Dependent variable: aggregated export flows</i>								
DtS trust	0.86** (0.35)	0.71* (0.36)	0.44 (0.32)	0.28 (0.39)	0.10 (0.39)	0.53 (0.40)	0.54 (0.37)	0.71* (0.39)
Common language	0.25** (0.10)	0.25** (0.10)	0.25** (0.10)	0.25** (0.10)	0.25** (0.10)	0.25** (0.10)	0.25** (0.10)	0.25** (0.10)
Weighted distance (log)	-0.94*** (0.24)	-0.96*** (0.23)	-1.00*** (0.22)	-1.02*** (0.21)	-1.05*** (0.21)	-0.99*** (0.22)	-0.98*** (0.23)	-0.96*** (0.23)
Common border	0.25*** (0.09)	0.25*** (0.09)	0.24*** (0.09)	0.24*** (0.09)	0.24*** (0.09)	0.25*** (0.09)	0.25*** (0.09)	0.25*** (0.09)
Press coverage	-0.48 (0.97)	-0.60 (0.95)	-0.81 (0.89)	-0.94 (0.90)	-1.08 (0.88)	-0.74 (0.91)	-0.73 (0.94)	-0.59 (0.95)
Transportation costs (log)	2.45 (1.57)	2.42 (1.55)	2.37 (1.50)	2.34 (1.49)	2.31 (1.46)	2.39 (1.52)	2.39 (1.50)	2.42 (1.54)
Same legal origin	0.42*** (0.13)	0.43*** (0.13)	0.45*** (0.12)	0.46*** (0.12)	0.47*** (0.11)	0.44*** (0.12)	0.44*** (0.13)	0.43*** (0.13)
Linguistic common roots	-0.13 (0.28)	-0.12 (0.28)	-0.10 (0.27)	-0.08 (0.28)	-0.07 (0.28)	-0.10 (0.28)	-0.10 (0.28)	-0.12 (0.28)
<i>Relevance</i>								
K-P rk LM Statistic (p-value)	16.95 (0.00)	23.58 (0.00)	19.89 (0.00)	23.33 (0.00)	18.46 (0.00)	20.40 (0.00)	15.27 (0.00)	20.43 (0.00)
<i>Weak Identification</i>								
K-P rk Wald Statistic	16.93	21.27	19.95	21.30	13.48	21.58	15.74	20.80
<i>Exogeneity</i>								
Hansen J-Stat (p-value)	0.13 (0.72)	0.02 (0.90)	0.06 (0.80)	0.21 (0.65)	0.58 (0.45)	0.01 (0.91)	0.01 (0.91)	0.02 (0.90)
Observations	679	679	679	679	679	679	679	679
Country-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Second-Stage estimates using somatic distance as instrument								
<i>Dependent variable: aggregated export flows</i>								
DtS trust	0.96** (0.47)	0.73 (0.46)	0.38 (0.45)	0.18 (0.51)	-0.14 (0.55)	0.50 (0.52)	0.51 (0.50)	0.74 (0.53)
Common language	0.25** (0.11)	0.25** (0.10)	0.25** (0.10)	0.25** (0.10)	0.25** (0.11)	0.25** (0.10)	0.25** (0.10)	0.25** (0.10)
Weighted distance (log)	-0.93*** (0.24)	-0.96*** (0.23)	-1.01*** (0.22)	-1.03*** (0.21)	-1.08*** (0.22)	-0.99*** (0.23)	-0.99*** (0.24)	-0.96*** (0.24)
Common border	0.26*** (0.10)	0.25*** (0.09)	0.24*** (0.09)	0.24*** (0.09)	0.23** (0.09)	0.25*** (0.09)	0.25*** (0.09)	0.25*** (0.09)
Press coverage	-0.40 (0.92)	-0.58 (0.93)	-0.86 (0.85)	-1.02 (0.89)	-1.27 (0.89)	-0.76 (0.90)	-0.76 (0.91)	-0.57 (0.92)
Transportation costs (log)	2.47 (1.60)	2.43 (1.55)	2.36 (1.49)	2.32 (1.48)	2.26 (1.46)	2.38 (1.51)	2.38 (1.49)	2.43 (1.55)
Same legal origin	0.41*** (0.13)	0.43*** (0.13)	0.45*** (0.12)	0.46*** (0.11)	0.48*** (0.11)	0.44*** (0.12)	0.44*** (0.12)	0.43*** (0.13)
Linguistic common roots	-0.14 (0.29)	-0.12 (0.29)	-0.09 (0.28)	-0.08 (0.28)	-0.05 (0.29)	-0.10 (0.29)	-0.10 (0.28)	-0.12 (0.29)
<i>Relevance</i>								
K-P rk LM Statistic (p-value)	13.97 (0.00)	22.09 (0.00)	16.56 (0.00)	20.81 (0.00)	13.27 (0.00)	18.66 (0.00)	14.32 (0.00)	19.30 (0.00)
<i>Weak Identification</i>								
K-P rk Wald Statistic	21.35	30.98	25.37	31.70	16.95	31.27	17.11	25.73
Observations	679	679	679	679	679	679	679	679
Country-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. This table presents the IV/LIML coefficients of estimating equation (1) when DtS trust is instrumented with both variables of cultural proximity of country-pairs (Panel A), and the IV/LIML estimates when instrumenting DtS trust only with a measure of somatic distance (Panel B). In each column, we use an alternative indicator of somatic distance as instrument for bilateral trust. In columns (1) to (4) we use the indicators made available by Guiso et al. (2008a), in columns (5) and (6) the indicators elaborated following the instructions given by them, and in columns (7) and (8) the measures that take the population density into account. The columns are labeled with the letters *H*, *C*, and *S*: *H* stands for height and hair, *C* for cephalic index, and *S* for skin. Cluster-robust standard errors are reported in parentheses and the coefficients are statistically different from zero at the ***1%, **5%, and *10% level.

Table A.4
Trade regression: Instrumenting DtS trust with alternative measures of somatic distance (full results; see Table 3)

	Guiso et al. (2008a)				Replication		Pop. Density	
	HHC (1)	HH (2)	HHCS (3)	HHS (4)	HHC (5)	HH (6)	HHC (7)	HH (8)
Panel A: First-stage regression								
<i>Dependent variable: Destination-to-Source trust</i>								
Somatic distance	-0.06*** (0.01)	-0.09*** (0.02)	-0.06*** (0.01)	-0.07*** (0.01)	-0.05*** (0.01)	-0.09*** (0.02)	-0.05*** (0.01)	-0.08*** (0.02)
Religious similarity	0.18*** (0.06)	0.15** (0.06)	0.20*** (0.06)	0.18*** (0.06)	0.17*** (0.07)	0.14** (0.06)	0.15** (0.06)	0.15** (0.06)
Common language	0.06 (0.06)	0.09 (0.07)	0.07 (0.06)	0.09 (0.07)	0.09 (0.06)	0.13* (0.07)	0.10* (0.06)	0.11 (0.07)
Weighted distance (log)	-0.08 (0.09)	-0.05 (0.09)	-0.04 (0.09)	-0.02 (0.09)	-0.12 (0.09)	-0.09 (0.09)	-0.06 (0.09)	-0.06 (0.09)
Common border	-0.05 (0.05)	0.00 (0.06)	-0.03 (0.05)	0.03 (0.06)	-0.09 (0.06)	-0.04 (0.06)	-0.03 (0.06)	-0.01 (0.06)
Press coverage	-0.39 (0.43)	-0.30 (0.45)	-0.30 (0.42)	-0.24 (0.45)	-0.49 (0.43)	-0.50 (0.46)	-0.39 (0.43)	-0.29 (0.45)
Transportation costs (log)	0.23 (0.75)	-0.05 (0.76)	0.37 (0.73)	0.17 (0.74)	0.40 (0.72)	0.36 (0.74)	-0.00 (0.77)	-0.10 (0.77)
Same legal origin	0.00 (0.05)	-0.00 (0.05)	-0.00 (0.05)	0.00 (0.04)	0.03 (0.05)	0.02 (0.05)	0.02 (0.05)	-0.01 (0.04)
Linguistic common roots	-0.04 (0.12)	-0.26** (0.13)	-0.07 (0.12)	-0.26** (0.13)	-0.10 (0.12)	-0.25** (0.13)	-0.14 (0.13)	-0.30** (0.13)
Observations	679	679	679	679	679	679	679	679
R-squared	0.81	0.82	0.82	0.82	0.81	0.81	0.80	0.81
Country-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Reduced form equation of international trade								
<i>Dependent variable: aggregated export flows</i>								
Somatic distance	-0.06* (0.03)	-0.06 (0.05)	-0.02 (0.03)	-0.01 (0.04)	0.01 (0.04)	-0.04 (0.05)	-0.03 (0.03)	-0.06 (0.05)
Religious similarity	0.11 (0.14)	0.09 (0.14)	0.12 (0.14)	0.11 (0.14)	0.12 (0.14)	0.09 (0.15)	0.10 (0.14)	0.09 (0.14)
Common language	0.30** (0.12)	0.32** (0.13)	0.29** (0.12)	0.28** (0.12)	0.26** (0.13)	0.32** (0.14)	0.30** (0.13)	0.33** (0.13)
Weighted distance (log)	-0.99*** (0.23)	-0.99*** (0.23)	-1.03*** (0.24)	-1.05*** (0.25)	-1.09*** (0.24)	-1.04*** (0.23)	-1.03*** (0.25)	-0.99*** (0.24)
Common border	0.21** (0.10)	0.25** (0.10)	0.23** (0.10)	0.24** (0.11)	0.24** (0.11)	0.23** (0.10)	0.23** (0.10)	0.25** (0.10)
Press coverage	-0.80 (0.98)	-0.80 (1.01)	-0.95 (0.97)	-1.03 (0.99)	-1.14 (0.95)	-1.00 (0.97)	-0.95 (0.98)	-0.79 (1.01)
Transportation costs (log)	2.49 (1.66)	2.32 (1.68)	2.63 (1.68)	2.60 (1.72)	2.64 (1.74)	2.63 (1.67)	2.45 (1.81)	2.28 (1.71)
Same legal origin	0.42*** (0.13)	0.43*** (0.14)	0.45*** (0.13)	0.46*** (0.13)	0.47*** (0.13)	0.45*** (0.13)	0.45*** (0.13)	0.42*** (0.14)
Linguistic common roots	-0.15 (0.31)	-0.30 (0.34)	-0.13 (0.31)	-0.15 (0.34)	-0.08 (0.34)	-0.23 (0.36)	-0.17 (0.33)	-0.33 (0.36)
Observations	679	679	679	679	679	679	679	679
R-squared	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Country-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. This table presents the coefficients of estimating the first-stage regression (Panel A), the reduced form equation of the dependent variable (Panel B), the IV coefficients of estimating equation (1) when DtS trust is instrumented with both variables of cultural proximity of country-pairs (Panel C), and the IV estimates when instrumenting DtS trust only with a measure of somatic distance (Panel D). In each column, we use an alternative indicator of somatic distance as instrument for bilateral trust. In columns (1) to (4) we use the indicators made available by Guiso et al. (2008a), in columns (5) and (6) the indicators elaborated following the instructions given by them, and in columns (7) and (8) the measures that take the population density into account. The columns are labeled with the letters *H*, *C*, and *S*: *H* stands for height and hair, *C* for cephalic index, and *S* for skin. Cluster-robust standard errors are reported in parentheses and the coefficients are statistically different from zero at the ***1%, **5%, and *10% level.

Table A.4 continued

	Guiso et al. (2008a)				Replication		Pop. Density	
	HHC	HH	HHCS	HHS	HHC	HH	HHC	HH
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel C: Second-stage estimates using somatic distance and religious similarity as instruments								
Dependent variable: aggregated export flows								
DtS trust	0.85** (0.35)	0.69** (0.34)	0.46 (0.31)	0.35 (0.35)	0.20 (0.36)	0.55 (0.36)	0.55 (0.37)	0.69* (0.36)
Common language	0.25** (0.10)	0.25** (0.10)	0.25** (0.10)	0.25** (0.10)	0.26** (0.10)	0.25** (0.10)	0.25** (0.10)	0.25** (0.10)
Weighted distance (log)	-0.94*** (0.24)	-0.96*** (0.23)	-1.00*** (0.22)	-1.02*** (0.21)	-1.03*** (0.21)	-0.98*** (0.22)	-0.98*** (0.23)	-0.96*** (0.23)
Common border	0.25*** (0.09)	0.25*** (0.09)	0.25*** (0.09)	0.25*** (0.09)	0.25*** (0.09)	0.25*** (0.09)	0.25*** (0.09)	0.25*** (0.09)
Press coverage	-0.34 (0.89)	-0.57 (0.92)	-0.87 (0.85)	-0.99 (0.89)	-1.18 (0.87)	-0.76 (0.90)	-0.76 (0.91)	-0.57 (0.92)
Transportation costs (log)	2.48 (1.57)	2.42 (1.55)	2.37 (1.50)	2.37 (1.49)	2.26 (1.46)	2.39 (1.52)	2.37 (1.49)	2.43 (1.54)
Same legal origin	0.41*** (0.13)	0.43*** (0.12)	0.45*** (0.12)	0.47*** (0.12)	0.49*** (0.11)	0.45*** (0.12)	0.44*** (0.13)	0.43*** (0.12)
Linguistic common roots	-0.11 (0.28)	-0.11 (0.27)	-0.11 (0.27)	-0.10 (0.27)	-0.13 (0.27)	-0.11 (0.27)	-0.11 (0.27)	-0.11 (0.27)
Relevance								
K-P rk LM Statistic (p-value)	16.95 (0.00)	23.58 (0.00)	19.89 (0.00)	23.33 (0.00)	18.46 (0.00)	20.40 (0.00)	15.27 (0.00)	20.43 (0.00)
Weak Identification								
K-P rk Wald Statistic	16.93	21.27	19.95	21.30	13.48	21.58	15.74	20.80
Exogeneity								
Hansen J-Stat (p-value)	0.13 (0.72)	0.02 (0.90)	0.06 (0.80)	0.21 (0.65)	0.58 (0.45)	0.01 (0.91)	0.01 (0.91)	0.02 (0.90)
Observations	679	679	679	679	679	679	679	679
Country-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel D: Second-stage estimates using somatic distance as instrument								
Dependent variable: aggregated export flows								
DtS trust	0.96** (0.47)	0.74 (0.51)	0.39 (0.44)	0.17 (0.52)	-0.17 (0.57)	0.49 (0.59)	0.50 (0.58)	0.75 (0.58)
Common language	0.24** (0.10)	0.25** (0.10)	0.26** (0.10)	0.27** (0.11)	0.28** (0.11)	0.26** (0.10)	0.26** (0.10)	0.25** (0.11)
Weighted distance (log)	-0.91*** (0.25)	-0.95*** (0.24)	-1.01*** (0.23)	-1.05*** (0.23)	-1.11*** (0.24)	-0.99*** (0.24)	-0.99*** (0.25)	-0.95*** (0.25)
Common border	0.26*** (0.10)	0.25*** (0.09)	0.24*** (0.09)	0.24*** (0.09)	0.23** (0.10)	0.25*** (0.09)	0.25*** (0.09)	0.25*** (0.09)
Press coverage	-0.42 (0.93)	-0.58 (0.93)	-0.83 (0.86)	-0.98 (0.90)	-1.23 (0.89)	-0.76 (0.90)	-0.76 (0.91)	-0.58 (0.92)
Transportation costs (log)	2.27 (1.68)	2.35 (1.63)	2.49 (1.58)	2.57* (1.56)	2.71* (1.61)	2.45 (1.60)	2.45 (1.65)	2.35 (1.65)
Same legal origin	0.42*** (0.13)	0.43*** (0.13)	0.45*** (0.12)	0.46*** (0.12)	0.48*** (0.11)	0.44*** (0.12)	0.44*** (0.13)	0.43*** (0.13)
Linguistic common roots	-0.11 (0.28)	-0.11 (0.27)	-0.11 (0.27)	-0.10 (0.28)	-0.10 (0.29)	-0.11 (0.27)	-0.11 (0.27)	-0.11 (0.27)
Religious similarity	-0.06 (0.19)	-0.02 (0.19)	0.04 (0.17)	0.08 (0.18)	0.15 (0.18)	0.02 (0.20)	0.02 (0.19)	-0.02 (0.20)
Relevance								
K-P rk LM Statistic (p-value)	14.65 (0.00)	20.97 (0.00)	17.65 (0.00)	19.93 (0.00)	11.88 (0.00)	16.72 (0.00)	14.74 (0.00)	18.43 (0.00)
Weak Identification								
K-P rk Wald Statistic	22.99	28.22	27.99	30.45	15.20	27.60	16.50	24.89
Observations	679	679	679	679	679	679	679	679
Country-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table A.5
Trade: controlling for linguistic similarity of country-pairs as in Melitz and Toubal (2014)

	Guiso et al. (2008a)				Replication		Pop. Density	
	HHC	HH	HHCS	HHS	HHC	HH	HHC	HH
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: First-stage regression								
<i>Dependent variable: Destination-to-Source trust</i>								
DtS trust	-0.05*** (0.01)	-0.07*** (0.02)	-0.06*** (0.01)	-0.07*** (0.01)	-0.05*** (0.02)	-0.08*** (0.02)	-0.04*** (0.01)	-0.06*** (0.02)
Religious similarity	0.15** (0.07)	0.14** (0.07)	0.17** (0.07)	0.17*** (0.06)	0.15** (0.07)	0.13* (0.07)	0.14* (0.07)	0.14** (0.07)
Common official language	-0.01 (0.05)	-0.05 (0.05)	-0.02 (0.05)	-0.07 (0.05)	0.00 (0.06)	0.00 (0.05)	-0.01 (0.05)	-0.03 (0.05)
Common spoken language	0.48*** (0.14)	0.38*** (0.14)	0.49*** (0.14)	0.40*** (0.14)	0.46*** (0.14)	0.40*** (0.15)	0.42*** (0.15)	0.36** (0.15)
Common native language	0.05 (0.17)	0.14 (0.17)	0.00 (0.16)	0.08 (0.17)	-0.02 (0.18)	-0.07 (0.19)	0.10 (0.17)	0.07 (0.17)
Linguistic proximity (ASPJ)	-0.00 (0.03)	-0.04 (0.03)	-0.03 (0.03)	-0.07** (0.03)	-0.03 (0.04)	-0.07* (0.04)	-0.01 (0.03)	-0.05 (0.04)
Weighted distance (log)	-0.03 (0.09)	-0.01 (0.09)	-0.01 (0.09)	0.01 (0.09)	-0.09 (0.08)	-0.09 (0.09)	-0.03 (0.09)	-0.04 (0.09)
Common border	-0.08 (0.05)	-0.04 (0.06)	-0.06 (0.05)	-0.01 (0.06)	-0.11* (0.06)	-0.07 (0.06)	-0.07 (0.06)	-0.04 (0.06)
Press coverage	-0.33 (0.38)	-0.44 (0.42)	-0.30 (0.37)	-0.41 (0.40)	-0.47 (0.41)	-0.55 (0.44)	-0.45 (0.41)	-0.43 (0.41)
Transportation costs (log)	0.07 (0.73)	-0.31 (0.74)	0.26 (0.71)	-0.06 (0.72)	0.31 (0.71)	0.28 (0.72)	-0.14 (0.75)	-0.25 (0.75)
Same legal origin	-0.05 (0.05)	-0.09* (0.05)	-0.05 (0.05)	-0.08* (0.05)	-0.01 (0.05)	-0.03 (0.05)	-0.04 (0.05)	-0.08* (0.05)
Observations	679	679	679	679	679	679	679	679
R-squared	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Country-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Reduced form equation of international trade								
<i>Dependent variable: aggregated export flows</i>								
DtS trust	-0.06* (0.03)	-0.09 (0.05)	-0.03 (0.03)	-0.04 (0.04)	0.01 (0.04)	-0.07 (0.07)	-0.03 (0.04)	-0.08 (0.05)
Religious similarity	0.15 (0.14)	0.14 (0.14)	0.16 (0.14)	0.16 (0.14)	0.15 (0.14)	0.13 (0.15)	0.14 (0.14)	0.14 (0.14)
Common official language	0.01 (0.11)	-0.03 (0.11)	-0.01 (0.11)	-0.03 (0.11)	-0.03 (0.12)	0.02 (0.11)	0.00 (0.11)	-0.01 (0.11)
Common spoken language	0.71** (0.36)	0.59* (0.35)	0.75** (0.36)	0.71* (0.37)	0.79** (0.37)	0.65* (0.35)	0.68* (0.36)	0.54 (0.35)
Common native language	0.30 (0.48)	0.40 (0.49)	0.29 (0.48)	0.33 (0.49)	0.35 (0.50)	0.20 (0.48)	0.34 (0.49)	0.31 (0.47)
Linguistic proximity (ASPJ)	-0.13 (0.09)	-0.17* (0.09)	-0.14 (0.08)	-0.16* (0.08)	-0.11 (0.10)	-0.19* (0.10)	-0.14 (0.09)	-0.19** (0.09)
Weighted distance (log)	-1.00*** (0.25)	-0.97*** (0.26)	-1.03*** (0.26)	-1.02*** (0.27)	-1.08*** (0.26)	-1.06*** (0.25)	-1.02*** (0.28)	-0.99*** (0.25)
Common border	0.16 (0.10)	0.21** (0.10)	0.18* (0.11)	0.20* (0.11)	0.19 (0.12)	0.17 (0.11)	0.18* (0.10)	0.21** (0.10)
Press coverage	-1.50 (1.01)	-1.59 (0.99)	-1.62 (1.02)	-1.68 (1.02)	-1.81* (1.04)	-1.73* (1.00)	-1.66 (1.01)	-1.54 (1.00)
Transportation costs (log)	2.18 (1.88)	1.72 (1.94)	2.33 (1.88)	2.18 (1.92)	2.28 (1.93)	2.38 (1.85)	2.05 (2.07)	1.72 (1.95)
Same legal origin	0.32** (0.13)	0.27* (0.14)	0.34*** (0.12)	0.33** (0.13)	0.36*** (0.12)	0.34*** (0.12)	0.33*** (0.13)	0.27* (0.14)
Observations	679	679	679	679	679	679	679	679
R-squared	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Country-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. This table presents the coefficients of estimating the first-stage regression (Panel A), the reduced form equation of the dependent variable (Panel B), the IV coefficients of estimating equation (1) when DtS trust is instrumented with both variables of cultural proximity of country-pairs (Panel C), and the IV estimates when instrumenting DtS trust only with a measure of somatic distance (Panel D). In each column, we use an alternative indicator of somatic distance as instrument for bilateral trust. In columns (1) to (4) we use the indicators made available by Guiso et al. (2008a), in columns (5) and (6) the indicators elaborated following the instructions given by them, and in columns (7) and (8) the measures that take the population density into account. The columns are labeled with the letters *H*, *C*, and *S*: *H* stands for height and hair, *C* for cephalic index, and *S* for skin. The indicators measuring linguistic similarity of country-pairs come from Melitz and Toubal (2014). Cluster-robust standard errors are reported in parentheses and the coefficients are statistically different from zero at the ***1%, **5%, and *10% level.

Table A.5 continued

	Guiso et al. (2008a)				Replication		Pop. Density	
	HHC	HH	HHCS	HHS	HHC	HH	HHC	HH
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel C: Second-stage estimates using somatic distance and religious similarity as instruments								
<i>Dependent variable: aggregated export flows</i>								
DtS trust	1.02** (0.45)	1.11** (0.47)	0.64* (0.34)	0.65* (0.37)	0.31 (0.44)	0.93* (0.50)	0.86* (0.52)	1.19** (0.51)
Common official language	0.02 (0.10)	0.02 (0.11)	0.00 (0.10)	0.00 (0.10)	-0.01 (0.10)	0.01 (0.10)	0.01 (0.10)	0.02 (0.11)
Common spoken language	0.22 (0.44)	0.17 (0.45)	0.46 (0.40)	0.45 (0.41)	0.67* (0.40)	0.28 (0.45)	0.32 (0.46)	0.12 (0.47)
Common native language	0.25 (0.48)	0.24 (0.49)	0.26 (0.45)	0.26 (0.45)	0.26 (0.43)	0.25 (0.48)	0.25 (0.47)	0.24 (0.50)
Linguistic proximity (ASPJ)	-0.13* (0.08)	-0.13* (0.08)	-0.12 (0.07)	-0.12 (0.07)	-0.12 (0.08)	-0.13 (0.08)	-0.12 (0.08)	-0.13* (0.08)
Weighted distance (log)	-0.97*** (0.26)	-0.97*** (0.26)	-0.99*** (0.24)	-0.99*** (0.24)	-1.00*** (0.23)	-0.97*** (0.25)	-0.98*** (0.25)	-0.96*** (0.27)
Common border	0.24** (0.11)	0.25** (0.11)	0.22** (0.10)	0.22** (0.10)	0.20** (0.09)	0.24** (0.11)	0.23** (0.10)	0.25** (0.11)
Press coverage	-1.15 (1.03)	-1.08 (1.06)	-1.45 (0.97)	-1.43 (0.98)	-1.69* (0.94)	-1.22 (1.04)	-1.29 (0.99)	-1.01 (1.08)
Transportation costs (log)	2.12 (1.82)	2.15 (1.85)	2.01 (1.73)	2.04 (1.73)	1.82 (1.65)	2.09 (1.80)	2.03 (1.73)	2.19 (1.87)
Same legal origin	0.37*** (0.11)	0.37*** (0.11)	0.38*** (0.10)	0.38*** (0.10)	0.39*** (0.10)	0.37*** (0.10)	0.37*** (0.11)	0.36*** (0.11)
<i>Relevance</i>								
K-P rk LM Statistic (p-value)	13.23 (0.00)	18.09 (0.00)	15.34 (0.00)	19.76 (0.00)	14.32 (0.00)	15.45 (0.00)	10.54 (0.00)	14.25 (0.00)
<i>Weak Identification</i>								
K-P rk Wald Statistic	11.88	14.32	15.15	16.52	8.39	13.01	7.86	11.60
<i>Exogeneity</i>								
Hansen J -Stat (p-value)	0.00 (0.97)	0.02 (0.90)	0.17 (0.68)	0.16 (0.69)	0.85 (0.36)	0.00 (0.95)	0.02 (0.88)	0.04 (0.84)
Observations	679	679	679	679	679	679	679	679
Country-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel D: Second-stage estimates using somatic distance as enstrument								
<i>Dependent variable: aggregated export flows</i>								
DtS trust	1.03* (0.56)	1.16* (0.64)	0.51 (0.46)	0.49 (0.54)	-0.25 (0.70)	0.89 (0.79)	0.77 (0.81)	1.32 (0.82)
Common official language	0.02 (0.10)	0.02 (0.11)	-0.00 (0.10)	-0.00 (0.10)	-0.03 (0.10)	0.01 (0.11)	0.01 (0.10)	0.03 (0.11)
Common spoken language	0.22 (0.45)	0.15 (0.48)	0.50 (0.41)	0.51 (0.44)	0.90** (0.45)	0.30 (0.51)	0.36 (0.53)	0.07 (0.54)
Common native language	0.25 (0.49)	0.23 (0.50)	0.29 (0.45)	0.29 (0.45)	0.35 (0.43)	0.26 (0.49)	0.27 (0.47)	0.22 (0.52)
Linguistic proximity (ASPJ)	-0.13 (0.08)	-0.13* (0.08)	-0.12 (0.08)	-0.12 (0.08)	-0.12 (0.08)	-0.13 (0.08)	-0.13 (0.08)	-0.13* (0.08)
Weighted distance (log)	-0.97*** (0.27)	-0.95*** (0.28)	-1.02*** (0.25)	-1.03*** (0.25)	-1.11*** (0.25)	-0.98*** (0.28)	-1.00*** (0.28)	-0.94*** (0.30)
Common border	0.24** (0.11)	0.25** (0.11)	0.21** (0.10)	0.21** (0.10)	0.16 (0.11)	0.23** (0.11)	0.23** (0.11)	0.26** (0.12)
Press coverage	-1.15 (1.03)	-1.07 (1.07)	-1.47 (0.96)	-1.48 (0.98)	-1.92** (0.95)	-1.24 (1.06)	-1.31 (1.00)	-0.98 (1.11)
Transportation costs (log)	2.10 (1.92)	2.08 (1.96)	2.20 (1.80)	2.21 (1.79)	2.35 (1.76)	2.13 (1.89)	2.15 (1.90)	2.05 (2.02)
Same legal origin	0.37*** (0.11)	0.37*** (0.12)	0.36*** (0.11)	0.36*** (0.11)	0.36*** (0.10)	0.37*** (0.11)	0.37*** (0.11)	0.37*** (0.12)
Religious similarity	-0.01 (0.19)	-0.03 (0.21)	0.07 (0.17)	0.08 (0.18)	0.18 (0.18)	0.01 (0.22)	0.03 (0.22)	-0.05 (0.24)
<i>Relevance</i>								
K-P rk LM Statistic (p-value)	11.27 (0.00)	15.96 (0.00)	12.58 (0.00)	15.51 (0.00)	7.78 (0.00)	11.18 (0.00)	8.12 (0.00)	11.22 (0.00)
<i>Weak Identification</i>								
K-P rk Wald Statistic	17.77	20.45	23.54	25.87	8.63	16.07	8.59	14.20
Observations	679	679	679	679	679	679	679	679
Country-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table A.6
StD trust and international migration: LIML

	Guiso et al. (2008a)				Replication		Pop. Density	
	HHC	HH	HHCS	HHS	HHC	HH	HHC	HH
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Second-stage estimates using somatic distance and religious similarity as instruments								
<i>Dependent variable: international immigration flows</i>								
StD Trust	2.20** (0.94)	1.83** (0.80)	0.92 (0.87)	0.56 (0.85)	1.34 (0.89)	1.12 (0.84)	2.00** (0.89)	1.65* (0.84)
Diff. in GDP p.c. (%)	2.49** (0.97)	2.40*** (0.88)	2.19*** (0.83)	2.10*** (0.78)	2.28*** (0.84)	2.23*** (0.82)	2.44*** (0.91)	2.36*** (0.86)
Common language	-0.40 (0.29)	-0.39 (0.28)	-0.37 (0.28)	-0.36 (0.28)	-0.38 (0.28)	-0.38 (0.28)	-0.39 (0.28)	-0.39 (0.28)
Weighted distance (log)	-0.42 (0.28)	-0.45* (0.27)	-0.53** (0.27)	-0.56** (0.27)	-0.49* (0.28)	-0.51* (0.28)	-0.44 (0.27)	-0.47* (0.27)
Common border	0.28 (0.31)	0.28 (0.31)	0.27 (0.32)	0.26 (0.32)	0.27 (0.31)	0.27 (0.32)	0.28 (0.31)	0.28 (0.31)
Same legal origin	0.54*** (0.20)	0.57*** (0.19)	0.65*** (0.20)	0.68*** (0.20)	0.61*** (0.19)	0.63*** (0.19)	0.56*** (0.20)	0.59*** (0.19)
Mig. stock 1960 (log)	0.23 (0.15)	0.25* (0.15)	0.30** (0.15)	0.32** (0.15)	0.28* (0.15)	0.29** (0.15)	0.24 (0.16)	0.26* (0.15)
<i>Relevance</i>								
K-P <i>rk</i> LM Statistic (p-value)	21.61 (0.00)	25.88 (0.00)	24.39 (0.00)	26.94 (0.00)	21.68 (0.00)	24.99 (0.00)	20.80 (0.00)	24.69 (0.00)
<i>Weak Identification</i>								
K-P <i>rk</i> Wald Statistic	14.41	16.10	18.64	19.19	12.54	17.59	14.74	17.68
<i>Exogeneity</i>								
Hansen <i>J</i> -Stat (p-value)	0.02 (0.88)	0.07 (0.80)	1.79 (0.18)	2.12 (0.15)	0.90 (0.34)	0.90 (0.34)	0.01 (0.93)	0.17 (0.68)
Observations	450	450	450	450	450	450	450	450
Country-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Second-stage estimates using somatic distance as instrument								
<i>Dependent variable: international immigration flows</i>								
StD Trust	2.40 (1.51)	1.60 (1.23)	-0.33 (1.30)	-0.47 (1.23)	-0.36 (1.79)	0.24 (1.36)	1.89 (1.50)	1.28 (1.33)
Diff. in GDP p.c. (%)	2.55** (1.02)	2.32*** (0.86)	1.77** (0.78)	1.73** (0.74)	1.76** (0.77)	1.93** (0.78)	2.40*** (0.89)	2.23*** (0.83)
Common language	-0.42 (0.29)	-0.36 (0.27)	-0.23 (0.29)	-0.22 (0.29)	-0.23 (0.30)	-0.27 (0.29)	-0.38 (0.29)	-0.34 (0.28)
Weighted distance (log)	-0.41 (0.28)	-0.46* (0.27)	-0.59** (0.27)	-0.60** (0.27)	-0.59** (0.29)	-0.55** (0.28)	-0.44* (0.27)	-0.48* (0.27)
Common border	0.30 (0.29)	0.26 (0.30)	0.18 (0.34)	0.18 (0.34)	0.18 (0.34)	0.21 (0.33)	0.27 (0.29)	0.25 (0.31)
Same legal origin	0.56** (0.22)	0.54** (0.22)	0.51** (0.24)	0.50** (0.24)	0.50** (0.25)	0.52** (0.24)	0.55** (0.22)	0.54** (0.23)
Mig. stock 1960 (log)	0.23 (0.16)	0.25 (0.16)	0.33** (0.16)	0.33** (0.16)	0.33** (0.16)	0.30** (0.15)	0.24 (0.17)	0.27* (0.16)
Religious similarity	-0.08 (0.56)	0.13 (0.51)	0.65 (0.52)	0.69 (0.51)	0.66 (0.67)	0.50 (0.54)	0.05 (0.57)	0.22 (0.54)
<i>Relevance</i>								
K-P <i>rk</i> LM Statistic (p-value)	13.99 (0.00)	22.52 (0.00)	20.47 (0.00)	23.71 (0.00)	8.23 (0.00)	17.72 (0.00)	17.50 (0.00)	19.50 (0.00)
<i>Weak Identification</i>								
K-P <i>rk</i> Wald Statistic	12.37	18.11	19.65	23.80	5.54	18.62	12.85	19.30
Observations	450	450	450	450	450	450	450	450
Country-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. This table presents the coefficients of estimating the IV/LIML coefficients of estimating equation (3) when StD trust is instrumented with both variables of cultural proximity of country-pairs (Panel A), and the IV estimates when instrumenting StD trust only with a measure of somatic distance (Panel B). In each column, we use an alternative indicator of somatic distance as instrument for bilateral trust. In columns (1) to (4) we use the indicators made available by GSZ, in columns (5) and (6) the indicators elaborated following the instructions given by Guiso et al. (2008a), and in columns (7) and (8) the measures that take the population density into account. The columns are labeled with the letters *H*, *C*, and *S*: *H* stands for height and hair, *C* for cephalic index, and *S* for skin. Cluster-robust standard errors are reported in parentheses and the coefficients are statistically different from zero at the ***1%, **5%, and *10% level.

Table A.7
DtS trust and international migration: LIML

	Guiso et al. (2008a)				Replication		Pop. Density	
	HHC	HH	HHCS	HHS	HHC	HH	HHC	HH
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Second-stage estimates using somatic distance and religious similarity as instruments								
<i>Dependent variable: international immigration flows</i>								
DtS Trust	1.88*	1.78*	0.27	0.09	0.66	0.93	1.76*	1.56
	(1.01)	(1.08)	(0.94)	(1.11)	(1.06)	(1.28)	(1.02)	(1.20)
Diff. in GDP p.c. (%)	2.10***	2.10***	2.05***	2.04***	2.06***	2.07***	2.10***	2.09***
	(0.79)	(0.79)	(0.71)	(0.70)	(0.72)	(0.74)	(0.78)	(0.77)
Common language	-0.22	-0.22	-0.30	-0.31	-0.28	-0.26	-0.22	-0.23
	(0.30)	(0.30)	(0.30)	(0.30)	(0.30)	(0.30)	(0.30)	(0.30)
Weighted distance (log)	-0.51*	-0.52*	-0.61**	-0.62**	-0.59**	-0.57**	-0.52**	-0.53**
	(0.27)	(0.27)	(0.27)	(0.27)	(0.27)	(0.28)	(0.26)	(0.27)
Common border	0.15	0.15	0.23	0.24	0.21	0.19	0.15	0.16
	(0.28)	(0.29)	(0.33)	(0.33)	(0.31)	(0.30)	(0.29)	(0.29)
Same legal origin	0.54**	0.55***	0.65***	0.67***	0.63***	0.61***	0.55***	0.56***
	(0.21)	(0.21)	(0.21)	(0.21)	(0.21)	(0.21)	(0.21)	(0.20)
Mig. stock 1960 (log)	0.19	0.20	0.31*	0.33*	0.28*	0.26	0.20	0.21
	(0.16)	(0.16)	(0.16)	(0.17)	(0.16)	(0.17)	(0.16)	(0.16)
<i>Relevance</i>								
K-P <i>rk</i> LM Statistic	13.93	15.21	13.88	14.52	13.15	11.70	15.97	13.97
(p-value)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
<i>Weak Identification</i>								
K-P <i>rk</i> Wald Statistic	15.05	11.37	14.19	10.10	13.23	8.62	14.73	10.10
<i>Exogeneity</i>								
Hansen <i>J</i> -Stat	0.60	0.65	2.50	2.48	1.88	1.59	0.74	0.88
(p-value)	(0.44)	(0.42)	(0.11)	(0.12)	(0.17)	(0.21)	(0.39)	(0.35)
Observations	463	463	463	463	463	463	463	463
Country-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Second-stage estimates using somatic distance as Instrument								
<i>Dependent variable: international immigration flows</i>								
DtS Trust	1.53	1.39	-0.37	-0.65	-0.29	0.05	1.40	1.06
	(1.02)	(1.16)	(1.03)	(1.29)	(1.29)	(1.52)	(1.05)	(1.33)
Diff. in GDP p.c. (%)	2.05***	2.04***	1.94***	1.93***	1.95***	1.96***	2.04***	2.02***
	(0.76)	(0.75)	(0.67)	(0.65)	(0.66)	(0.68)	(0.75)	(0.73)
Common language	-0.19	-0.20	-0.24	-0.25	-0.24	-0.23	-0.20	-0.20
	(0.29)	(0.29)	(0.30)	(0.31)	(0.30)	(0.30)	(0.29)	(0.29)
Weighted distance (log)	-0.52**	-0.52**	-0.61**	-0.62**	-0.61**	-0.59**	-0.52**	-0.54**
	(0.26)	(0.26)	(0.26)	(0.27)	(0.27)	(0.27)	(0.26)	(0.26)
Common border	0.14	0.14	0.21	0.22	0.20	0.19	0.14	0.16
	(0.29)	(0.29)	(0.34)	(0.36)	(0.34)	(0.32)	(0.30)	(0.30)
Same legal origin	0.47**	0.47**	0.49**	0.50**	0.49**	0.49**	0.47**	0.48**
	(0.22)	(0.22)	(0.24)	(0.25)	(0.24)	(0.23)	(0.22)	(0.22)
Mig. stock 1960 (log)	0.20	0.20	0.32*	0.34*	0.31*	0.29*	0.20	0.23
	(0.16)	(0.16)	(0.17)	(0.18)	(0.17)	(0.17)	(0.16)	(0.17)
Religious similarity	0.25	0.27	0.55	0.59	0.54	0.48	0.27	0.33
	(0.33)	(0.35)	(0.40)	(0.44)	(0.45)	(0.44)	(0.33)	(0.37)
<i>Relevance</i>								
K-P <i>rk</i> LM Statistic	11.09	13.19	11.82	13.10	7.83	8.44	12.79	10.71
(p-value)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)
<i>Weak Identification</i>								
K-P <i>rk</i> Wald Statistic	20.49	17.22	22.35	16.22	14.61	10.73	23.49	14.29
Observations	463	463	463	463	463	463	463	463
Country-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. This table presents the coefficients of estimating the IV/LIML coefficients of estimating equation (4) when DtS trust is instrumented with both variables of cultural proximity of country-pairs (Panel A), and the IV estimates when instrumenting DtS trust only with a measure of somatic distance (Panel B). In each column, we use an alternative indicator of somatic distance as instrument for bilateral trust. In columns (1) to (4) we use the indicators made available by Guiso et al. (2008a), in columns (5) and (6) the indicators elaborated following the instructions given by them, and in columns (7) and (8) the measures that take the population density into account. The columns are labeled with the letters *H*, *C*, and *S*: *H* stands for height and hair, *C* for cephalic index, and *S* for skin. Cluster-robust standard errors are reported in parentheses and the coefficients are statistically different from zero at the ***1%, **5%, and *10% level.

Table A.8
Migration: Instrumenting StD trust with alternative measures of somatic distance (full results; see Table 6)

	Guiso et al. (2008a)				Replication		Pop. Density	
	HHC (1)	HH (2)	HHCS (3)	HHS (4)	HHC (5)	HH (6)	HHC (7)	HH (8)
Panel A: First-stage regression								
<i>Dependent variable: Source-to-Destination trust</i>								
Somatic distance	-0.04*** (0.01)	-0.06*** (0.01)	-0.04*** (0.01)	-0.05*** (0.01)	-0.03** (0.01)	-0.06*** (0.01)	-0.04*** (0.01)	-0.06*** (0.01)
Religious similarity	0.21*** (0.07)	0.18*** (0.06)	0.21*** (0.07)	0.18*** (0.06)	0.21*** (0.08)	0.16** (0.07)	0.20*** (0.07)	0.17** (0.07)
Diff. in GDP p.c. (%)	-0.22 (0.14)	-0.24* (0.12)	-0.18 (0.13)	-0.20* (0.11)	-0.21* (0.12)	-0.22* (0.11)	-0.24* (0.14)	-0.24** (0.12)
Common language	0.07 (0.05)	0.07 (0.05)	0.07 (0.05)	0.07 (0.05)	0.10** (0.05)	0.13*** (0.05)	0.09* (0.05)	0.09* (0.05)
Weighted distance (log)	-0.03 (0.05)	-0.00 (0.05)	0.01 (0.05)	0.03 (0.05)	-0.04 (0.05)	-0.00 (0.05)	-0.01 (0.05)	-0.00 (0.04)
Common border	-0.03 (0.05)	-0.00 (0.05)	-0.01 (0.05)	0.02 (0.05)	-0.07 (0.05)	-0.05 (0.05)	-0.03 (0.05)	-0.01 (0.05)
Same legal origin	-0.01 (0.04)	-0.02 (0.04)	-0.01 (0.04)	-0.03 (0.04)	-0.01 (0.05)	-0.01 (0.04)	-0.01 (0.04)	-0.03 (0.04)
Mig. stock 1960 (log)	0.04 (0.02)	0.03 (0.02)	0.04 (0.02)	0.03 (0.02)	0.03 (0.02)	0.03 (0.02)	0.04* (0.02)	0.04 (0.02)
Observations	450	450	450	450	450	450	450	450
R-squared	0.88	0.89	0.89	0.89	0.88	0.89	0.88	0.89
Country-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Reduced form equation of international migration								
<i>Dependent variable: international immigration flows</i>								
Somatic distance	-0.09 (0.07)	-0.09 (0.08)	0.01 (0.06)	0.03 (0.08)	0.01 (0.07)	-0.02 (0.10)	-0.08 (0.07)	-0.07 (0.09)
Religious similarity	0.43 (0.39)	0.41 (0.40)	0.58 (0.43)	0.60 (0.45)	0.58 (0.45)	0.53 (0.46)	0.42 (0.40)	0.44 (0.41)
Diff. in GDP p.c. (%)	2.01** (0.84)	1.93** (0.84)	1.83** (0.84)	1.82** (0.82)	1.83** (0.80)	1.88** (0.83)	1.94** (0.83)	1.91** (0.84)
Common language	-0.25 (0.35)	-0.26 (0.35)	-0.26 (0.34)	-0.26 (0.33)	-0.27 (0.35)	-0.24 (0.36)	-0.21 (0.35)	-0.23 (0.35)
Weighted distance (log)	-0.47 (0.30)	-0.47 (0.31)	-0.60* (0.32)	-0.62* (0.33)	-0.58* (0.31)	-0.55* (0.33)	-0.46 (0.30)	-0.49 (0.32)
Common border	0.23 (0.37)	0.26 (0.37)	0.19 (0.39)	0.17 (0.40)	0.21 (0.39)	0.20 (0.38)	0.23 (0.36)	0.23 (0.38)
Same legal origin	0.53** (0.26)	0.51* (0.26)	0.51* (0.28)	0.52* (0.28)	0.51* (0.28)	0.51* (0.28)	0.52** (0.26)	0.49* (0.26)
Mig. stock 1960 (log)	0.32* (0.17)	0.31* (0.17)	0.31* (0.17)	0.32* (0.17)	0.31* (0.17)	0.31* (0.17)	0.32* (0.16)	0.31* (0.17)
Observations	450	450	450	450	450	450	450	450
R-squared	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Country-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. This table presents the coefficients of estimating the first-stage regression (Panel A), the reduced form equation of the dependent variable (Panel B), the IV coefficients of estimating equation (3) when StD trust is instrumented with both variables of cultural proximity of country-pairs (Panel C), and the IV estimates when instrumenting StD trust only with a measure of somatic distance (Panel D). In each column, we use an alternative indicator of somatic distance as instrument for bilateral trust. In columns (1) to (4) we use the indicators made available by GSZ, in columns (5) and (6) the indicators elaborated following the instructions given by Guiso et al. (2008a), and in columns (7) and (8) the measures that take the population density into account. The columns are labeled with the letters *H*, *C*, and *S*: *H* stands for height and hair, *C* for cephalic index, and *S* for skin. Cluster-robust standard errors are reported in parentheses and the coefficients are statistically different from zero at the ***1%, **5%, and *10% level.

Table A.9
Migration: Instrumenting DtS trust with alternative measures of somatic distance (full results; see Table 7)

	Guiso et al. (2008a)				Replication		Pop. Density	
	HHC (1)	HH (2)	HHCS (3)	HHS (4)	HHC (5)	HH (6)	HHC (7)	HH (8)
Panel A: First-stage regression								
<i>Dependent variable: Destination-to-Source trust</i>								
Somatic distance	-0.06*** (0.01)	-0.06*** (0.01)	-0.05*** (0.01)	-0.05*** (0.01)	-0.05*** (0.01)	-0.06*** (0.02)	-0.06*** (0.01)	-0.05*** (0.01)
Religious similarity	0.07 (0.07)	0.06 (0.07)	0.08 (0.07)	0.07 (0.07)	0.08 (0.08)	0.06 (0.08)	0.06 (0.07)	0.06 (0.07)
Diff. in GDP p.c. (%)	0.03 (0.11)	-0.01 (0.11)	0.08 (0.10)	0.04 (0.11)	0.05 (0.10)	0.01 (0.11)	0.01 (0.11)	-0.01 (0.11)
Common language	-0.02 (0.06)	-0.03 (0.06)	-0.02 (0.06)	-0.03 (0.06)	0.03 (0.06)	0.03 (0.06)	0.01 (0.05)	-0.01 (0.06)
Weighted distance (log)	0.01 (0.05)	0.01 (0.05)	0.05 (0.06)	0.04 (0.06)	-0.01 (0.05)	0.01 (0.05)	0.03 (0.05)	0.01 (0.05)
Common border	0.05 (0.06)	0.08 (0.07)	0.07 (0.07)	0.09 (0.07)	-0.00 (0.07)	0.03 (0.07)	0.06 (0.06)	0.06 (0.07)
Same legal origin	0.02 (0.05)	0.01 (0.05)	0.02 (0.04)	0.00 (0.05)	0.03 (0.05)	0.02 (0.05)	0.02 (0.05)	0.00 (0.05)
Mig. Stock 1960 (log)	0.07*** (0.02)	0.06** (0.03)	0.06** (0.02)	0.06** (0.03)	0.06** (0.03)	0.06** (0.03)	0.07*** (0.03)	0.06** (0.03)
Observations	463	463	463	463	463	463	463	463
R-squared	0.88	0.87	0.88	0.88	0.87	0.87	0.88	0.87
Country-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Reduced form equation of international migration								
<i>Dependent variable: international immigration flows</i>								
Somatic distance	-0.08 (0.06)	-0.08 (0.08)	0.02 (0.06)	0.03 (0.08)	0.01 (0.07)	-0.00 (0.10)	-0.08 (0.07)	-0.06 (0.08)
Religious similarity	0.36 (0.39)	0.36 (0.40)	0.52 (0.42)	0.55 (0.44)	0.51 (0.45)	0.49 (0.46)	0.35 (0.39)	0.39 (0.41)
Diff. in GDP p.c. (%)	2.10** (0.81)	2.03** (0.82)	1.91** (0.82)	1.90** (0.80)	1.93** (0.78)	1.97** (0.80)	2.05** (0.81)	2.01** (0.81)
Common language	-0.22 (0.36)	-0.23 (0.36)	-0.23 (0.34)	-0.23 (0.34)	-0.24 (0.36)	-0.23 (0.37)	-0.19 (0.36)	-0.21 (0.36)
Weighted distance (log)	-0.50 (0.31)	-0.50 (0.31)	-0.63* (0.32)	-0.65* (0.33)	-0.60* (0.31)	-0.59* (0.33)	-0.48 (0.30)	-0.53 (0.32)
Common border	0.22 (0.37)	0.25 (0.37)	0.18 (0.39)	0.16 (0.40)	0.20 (0.39)	0.19 (0.38)	0.22 (0.36)	0.22 (0.38)
Same legal origin	0.51* (0.26)	0.49* (0.26)	0.49* (0.28)	0.50* (0.28)	0.49* (0.28)	0.49* (0.28)	0.50* (0.26)	0.48* (0.26)
Mig. Stock 1960 (log)	0.30* (0.17)	0.29* (0.17)	0.30* (0.17)	0.30* (0.17)	0.30* (0.17)	0.29* (0.17)	0.30* (0.16)	0.29* (0.17)
Observations	463	463	463	463	463	463	463	463
R-squared	0.89	0.90	0.89	0.89	0.89	0.89	0.90	0.89
Country-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. This table presents the coefficients of estimating the first-stage regression (Panel A), the reduced form equation of the dependent variable (Panel B), the IV coefficients of estimating equation (4) when DtS trust is instrumented with both variables of cultural proximity of country-pairs (Panel C), and the IV estimates when instrumenting DtS trust only with a measure of somatic distance (Panel D). In each column, we use an alternative indicator of somatic distance as instrument for bilateral trust. In columns (1) to (4) we use the indicators made available by Guiso et al. (2008a), in columns (5) and (6) the indicators elaborated following the instructions given by them, and in columns (7) and (8) the measures that take the population density into account. The columns are labeled with the letters *H*, *C*, and *S*: *H* stands for height and hair, *C* for cephalic index, and *S* for skin. Cluster-robust standard errors are reported in parentheses and the coefficients are statistically different from zero at the ***1%, **5%, and *10% level.

Table A.9 continued

[illegible]

Chapter 3

Is the Role of Trust in International Migration Gender-Specific?

3.1 Introduction

Female migrants were long believed to be economically unproductive agents whose location choices only depend on their husbands' decisions to move abroad. Because of this stereotype, women were long neglected in the literature on international migration. Only since the 1980s did case studies show that women also move for economic reasons and actively participate in destination countries' labour markets (United Nations, 1993). New datasets classifying international migration by gender simultaneously revealed that the proportion of women in total migrant stock was considerable. In 2013, women were estimated to represent almost 50 percent of total migrants in the world and to outnumber men in Europe, Northern America, Oceania, Latin America, and the Caribbean (United Nations, 2013).

As women were shown to move independently and to significantly participate in the private and in the economic spheres of host countries, scholars increasingly focused their research on potential female migrants. They found that determinants of female migration

may be fundamentally different from the ones influencing men's location decisions (Grieco and Boyd, 2003; Pfeiffer et al., 2008). In line with this suggestion, the trust in citizens of potential destination countries, which is referred to as "source-to-destination" (StD) trust, is here suspected to be such a gender-specific determinant. Whereas the previous chapter focuses on the average effect that StD trust may have on total migration flows, this chapter attempts to dismantle the potentially heterogeneous effects between female and male migration flows. Indeed, the insignificant effect of StD trust found in the previous chapter does not give any indication of the effects between subgroups. For instance, as women were shown to be more risk-averse than men and to suffer more stress when moving abroad, StD trust may very well be of particular importance for potential female migrants while playing a negligible role for male migrants. Such heterogeneous effects may not be seen when computing average effects by focusing on total migration flows.

To dismantle these potentially heterogeneous effects, individual location choices are derived from a random utility maximisation (RUM) model that allows migrants to systematically differ from individuals who decide to stay in their home country. The structural equation is then estimated using various approaches in order to address potential biases caused by endogeneity, heteroscedasticity or sample selection. International migration flows are approximated with data provided by the Global Bilateral Migration Database (GBMD). The indicator of bilateral trust is an indicator provided by the Eurobarometer surveys that measures the average trust that individuals originating from a given source country have in citizens of potential destination countries. The sample includes migration flows that took place within Europe over the years 1970 to 2000.

The estimations do not yield robust evidence in favour of the hypothesis that StD trust affects the location decisions of potential female migrants differently than those of potential male migrants. On the contrary, when dismantling the effect, the coefficients on StD trust are generally insignificant in both settings, suggesting that neither women

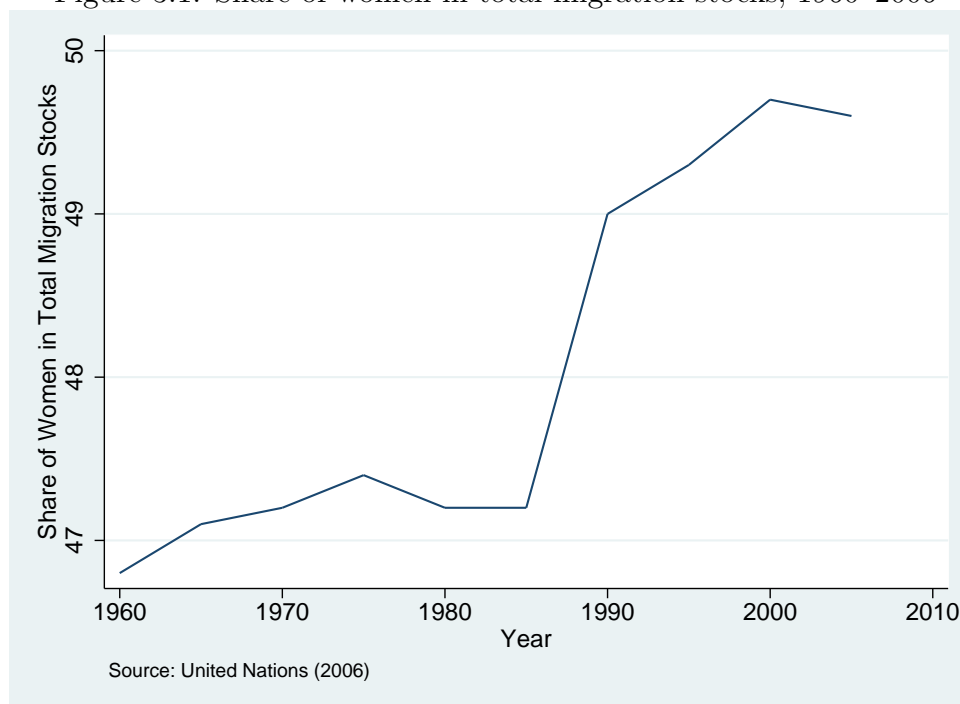
nor men are affected by StD trust when deciding to move abroad.

The rest of the chapter is organised as follows. Section 3.2 briefly describes the role of women in the literature on international migration. Section 3.3 presents the theoretical model and section 3.4 presents the data necessary to perform the analysis. The identification strategies and empirical approaches used to estimate the structural equation are described in section 3.5. Section 3.6 reports the results of separately regressing total, female and male migration flows on bilateral trust and other potential determinants of international migration. The last section concludes.

3.2 Women in International Migration

Women were long ignored in the migration literature because they were considered to be passive agents who only move abroad for marriage or family reunification (Donato et al., 2006). This stereotype made it seem unnecessary to find other explanations for female migration (Kofman, 1999). Early economic models of migration thus exclusively focused on the experiences of men (Dhar, 2010). However, these gender-insensitive models were increasingly criticised since Morokvasic (1983, 1984) demonstrated that women also move for economic reasons and significantly contribute to the host countries' economic and social activities. The simultaneous appearance of datasets classifying international migration by gender further highlighted the scope of female migration. Figure 3.1 shows the evolution of the proportion of women in total migration stocks. In 1960, women were estimated to represent 46.8 percent of total migrant stocks, a proportion that increased over time to reach 49.6 percent in 2006 (United Nations, 2006). In 2013, almost 232 million individuals are estimated to live in foreign countries, 120 million men and 111 million women (United Nations, 2013). These numbers are surprising when considering the large body of the literature in experimental economics that finds that women are more risk-

Figure 3.1: Share of women in total migration stocks, 1960–2006



averse than men.¹ Since Halek and Eisenhauer (2001) and Jaeger et al. (2010) show that risk-averse individuals are less likely to migrate internationally, one could expect women to represent a lower share of total migration stocks.² Yet, Pedraza (1991) and Grieco and Boyd (2003) suggest that women experience migration differently than men and that their location choices might be affected by factors that do not influence men's decisions to move abroad. For instance, in analysing the migration decisions of Mexican men and women, Kanaiaupuni (2000) finds that migrant networks affect the decisions of both similarly but that education functions differently for men and women: while educated Mexican women are more likely to move abroad, educated Mexican men are less likely to do so.³

¹Among many others, see Schubert et al. (1999), Eckel and Grossman (2008), Croson and Gneezy (2009), Borghans et al. (2009) and Booth et al. (2014) for studies that find evidence in favour of a greater risk aversion in women compared to men.

²Comparing migration within LDCs, Stark and Levhari (1982) find the opposite: more risk averse individuals are more likely to move from rural to urban environments in order to diversify income and reduce risk. However, these are two very different settings. As I focus on international migration among European countries, the findings of Jaeger et al. (2010) are more likely to apply here.

³See United Nations (1993) for further studies on migration in developing countries that are in line with the statement that migration experiences are different for men and women.

Similarly, I suspect bilateral trust to be a gender-specific determinant. Focusing on total migration flows in the previous chapter, no significant relationship between bilateral trust and migration was found. However, this aggregate effect might result from the fact that trust affects women's decisions to move abroad but not men's decisions. As women were shown to be more risk averse and to endure more stress than men when moving abroad (Pedraza, 1991), trust in the citizens of potential destination countries might be of particular importance for female migrants. Although Eckel and Wilson (2004) and Houser et al. (2010) find that risk aversion and trust are two different concepts, these concepts might interact: the likelihood that a risk-averse individual migrates to a foreign country could increase if trust plays a significant role in the decision-making process and vice versa.⁴

Table 3.1: Proportion of women in migration stocks by region, 1990–2013

Region	1990	2000	2010	2013
Europe	51.4	51.8	51.6	51.9
Northern America	51.1	50.5	51.2	51.2
Oceania	49.1	50.0	50.2	50.2
Latin America & the Caribbean	49.8	50.1	51.5	51.6
Africa	46.6	47.2	46.1	45.9
Asia	45.6	45.4	42.0	41.6

Source: United Nations (2013).

The migration data presented in Table 3.1 shows that, since 2000, there are more immigrant women than men in Europe, Northern America, Oceania, Latin America and the Caribbean. These large proportions of female migrants are partially explained by the high labour demand of these countries for traditional female occupations, such as healthcare workers (particularly nursing), domestic workers, teachers and manufacturing jobs (Grieco and Boyd, 2003; Pessar, 2005; Mahler and Pessar, 2006; Pfeiffer et al., 2008; Dhar, 2010; BBC, 2013; Lupieri, 2013). Moreover, women increasingly move to devel-

⁴Houser et al. (2010) conclude that “trust decisions are not tightly connected to a person's risk attitudes”. See also Fehr (2009) who shows that people who trust do not necessarily take risks.

oped regions in order to escape patriarchal authority and to benefit from more freedom, rights, and independence. While there is an increasing number of studies analysing the determinants of female migration (Pedraza, 1991; Grieco and Boyd, 2003), none of them address the potential role of StD trust in this decision.

3.3 Theoretical Framework

The theoretical framework is similar to the one used in Chapter 2 as it is again derived from a RUM model and allows migrants to systematically differ from individuals who decide to stay in their home country (Roy, 1951; Sjaastad, 1962; Anderson, 1979; Borjas, 1987, 1989, 1994, 1999). This framework is again employed because of its success in predicting migration patterns observed in the data.⁵ For convenience, the derivation is restated here.

A potential migrant i who can either stay at home (s) or move to destination k is assumed to face the following location-specific utility functions:

$$U^i = \begin{cases} U_{ss}^i = V_{ss} + \epsilon_{ss}^i & \text{if } i \text{ is staying in } s, \\ U_{sk}^i = V_{sk} + \epsilon_{sk}^i & \text{if } i \text{ is living in } k, \end{cases}$$

where V_{ss} and V_{sk} are the observable utilities (also called the “representative” utilities) that result from staying at home or from moving to destination k , respectively, and ϵ_s^i and ϵ_k^i account for the corresponding stochastic individual-specific utilities. Potential migrants are hence assumed to have identical preferences except for their idiosyncratic utility ϵ^i . In order to derive the probability that a would-be migrant chooses location k among a set of potential locations $d \in D$, McFadden (1976, 1974) assumes that the random parts of utility are independently and identically distributed with a type I extreme

⁵See, among others Mayda (2010), Beine et al. (2011), Grogger and Hanson (2011), Ortega and Peri (2012), and Beine and Parsons (2012)

value distribution. The choice probability can then be approximated using the following conditional logit model:

$$P_{sk}^i = \frac{e^{V_{sk}}}{\sum_d e^{V_{sd}}}, \quad (3.1)$$

where P_{sk}^i stands for the probability that individual i originating from country s chooses location k and $\sum_d e^{V_{sd}}$ sums the exponential of the representative utility of all potential locations d , including the utility derived from staying at home and the utility derived from moving to country k .

However, the distributional assumption a la McFadden implies the Independence from Irrelevant Alternative (IIA) property, a property that is rarely satisfied when observing migration patterns.⁶ To address this concern, Ortega and Peri (2013) derive the choice probabilities from a Generalised Extreme Value (GEV) generating function that allows the random utility components of individuals moving abroad to be correlated.⁷ Under this assumption, the probability that individuals originating from s choose destination k from a set of potential locations d can be written as:

$$P_{sk}^i = \frac{e^{V_{sk}/\tau} (\sum_d e^{V_{sd}/\tau})^{\tau-1}}{(\sum_d e^{V_{sd}/\tau})^\tau},$$

where $\sum_d e^{V_{sd}/\tau}$ again sums the exponential of the representative utility of all locations d , and τ measures the degree of correlation in the random utility component of migrants. Ortega and Peri (2013) do not allow ϵ_{ss}^i and ϵ_{sk}^i to be correlated, which amounts to treating source countries as singletons. The probability that potential migrants decide to stay at home is then given by

$$P_{ss}^i = \frac{e^{V_{ss}}}{(\sum_d e^{V_{sd}/\tau})^\tau}.$$

⁶For more details, see, among others, Train (2009), Bertoli and Moraga (2013), Ortega and Peri (2013), and Chapter 4 in this thesis.

⁷This amounts to grouping all destination countries in one nest. Ortega and Peri (2013) only allow for spacial correlation. For a GEV generating function that allows spatial and serial correlation in the unobserved parts of utility, see Bertoli and Moraga (2012, 2013).

The ratio of these two choice probabilities is then

$$\frac{P_{sk}^i}{P_{ss}^i} = \frac{e^{V_{sk}/\tau}}{e^{V_{ss}}} z_s, \quad (3.2)$$

where $z_s = (\sum_d e^{V_{sd}/\tau})^{\tau-1}$. The choice probabilities P_{sk}^i and P_{ss}^i are generally approximated with the number of people originating from country s who move to destination k (M_{sk}) and those who stay at home (M_{ss}), respectively. When taking the log and adding time subscripts, equation (3.2) can be rewritten as

$$\log \left(\frac{M_{skt}}{M_{sst}} \right) = \frac{V_{skt}}{\tau} - V_{sst} + \log z_{st} + \epsilon_{skt}, \quad (3.3)$$

where ϵ_{skt} captures the error of approximating the choice probabilities with M_{skt} and M_{sst} . Including time-varying dummy variables for the source countries, equation (3.3) simplifies to

$$\log M_{skt} = \frac{V_{skt}}{\tau} + \lambda_{st} + \epsilon_{skt}, \quad (3.4)$$

where $\lambda_{st} \equiv \log M_{sst} - V_{sst} + \log z_{st}$.

Let the representative utility component V_{skt} of migrants originating from s who choose location k in period t depend on bilateral trust, on differences between the gross domestic product (GDP) per capita at home and in destination k , on destination country-specific factors that vary over time and on bilateral migration costs. The latter are approximated with an indicator measuring the geographic and linguistic distance between two countries and with binary variables taking the value one whenever two countries share a border or have the same legal origin. Beine et al. (2011) further find that migration costs depend on the size of immigrant networks established in the destination country, and Chapter 4 of this thesis provides evidence that religious similarity might significantly affect bilateral migration flows. These theoretical considerations thus suggest the

following specification:

$$\log M_{skt} = \beta_0 + \beta_2 trust_{skt} + \beta_3 N_{skt} + \beta_4 \Delta gdp_{skt} + \mathbf{X}'_{sk} \gamma + \lambda_{kt} + \lambda_{st} + \epsilon_{skt}, \quad (3.5)$$

where $trust_{skt}$ measures the average bilateral trust that citizens originating from s place in citizens from country k in period t , Δgdp_{skt} stands for the difference in GDP per capita between country pairs, N_{skt} measures the size of immigrant networks established in location k in period t , \mathbf{X}'_{sk} is a vector including the time-invariant determinants of bilateral migration flows and λ_{kt} captures time-varying destination-specific factors that affect the utility of migrants. To analyse whether bilateral trust is a gender-specific variable, M_{skt} will alternatively capture total, female or male migrants from country s who choose location k in period t .

3.4 Data

The data on international migration used to estimate the relationships of interest comes from the Global Bilateral Migration Database (GBMD) collected by Ozden, Parson, Schiff and Walmsley (2011).⁸ This unique database reports bilateral migration stocks by gender that are observed between 226 source and destination countries over the years 1960, 1970, 1980, 1990, and 2000. When merging and harmonizing the data from official registers and census rounds, Ozden et al. (2011) ensure consistency by verifying that migration is always defined based on the foreign-born concept. With the data made available by the GBMD, total bilateral migration flows from country s to country k in period t can be approximated the following way:

$$M_{skt} = S_{skt+1} - S_{skt},$$

⁸The GBMD can be downloaded on the following Internet page of The World Bank: <http://data.worldbank.org/data-catalogue/global-bilateral-migration-database>.

where S_{skt+1} and S_{skt} stand for the GBMD bilateral migration stocks in years $t + 1$ and t , respectively. M_{skt} hence captures the total decennial gross migration flows between two countries. Analogously, female migration flows are computed by subtracting stocks of female migrants in period t from the corresponding stock in period $t + 1$, and the male migration flows are computed by taking the difference in stocks of male migrants. This approximation results in almost 30 percent negative decennial migration flows and nearly 60 percent positive flows. Table 3.2 reports the five largest negative and the five largest positive decennial migration flows included in this analysis. The first row suggests that between 1990 and 2000 the stock of Portuguese living in France decreased by approximately 468,000 individuals (220,000 women and 248,000 men). The largest increase was observed between Poland and France, where the stock of Polish citizens living in France increased by almost 661,200 individuals from 1990 to 2000. Unfortunately, when approximating decennial migration flows with differences in stocks, there is no information about the distribution over time or about the origin of these changes. For instance, it is impossible to know whether decreases in the stocks of migrants were caused by return migration, death, and/or migration to a third country. Yet, to the best of my knowledge, the GBMD is the only dataset that allows one to approximate bilateral migration flows by gender from 1970 to 1990.⁹

The decennial migration flows are regressed on an indicator of bilateral trust made available by the Eurobarometer surveys. The survey question measuring bilateral trust is the following: *“I would like to ask you a question about how much trust you have in people from various countries. For each, please tell me whether you have a lot of trust, some trust, not very much trust, or no trust at all.”* It was first asked in the year 1970 in five European countries. From 1970 to 1996, this question was asked 10 times and the country sample increased each time.¹⁰ The measure of StD trust is constructed following

⁹Ortega and Peri (2009, 2011, 2012) established a dataset providing bilateral migration flows but these are not classified by gender.

¹⁰The data can be downloaded from the ZACAT-GESIS Online Study catalogue,

Table 3.2: Some decennial international migration flows

Source	Destination	Year	Total	Female	Male
<i>Largest negative decennial migration flows</i>					
Portugal	France	1990-2000	-468,323	-219,988	-248,335
Italy	France	1990-2000	-283,338	-143,467	-139,870
Spain	France	1990-2000	-277,463	-151,277	-126,187
Poland	Lithuania	1990-2000	-254,076	-133,345	-120,731
Italy	France	1970-1980	-246,554	-111,189	-135,365
<i>Largest positive decennial migration flows</i>					
Poland	France	1990-2000	661,156	318,058	343,099
Czech Republic	France	1990-2000	210,221	105,695	104,528
Poland	Germany	1990-2000	209,147	31,846	177,301
Ireland	France	1990-2000	176,899	89,052	87,846
Poland	United Kingdom	1990-2000	132,474	73,996	58,478

Source: Global Bilateral Migration Database, Ozden et al. (2011).

Guiso et al. (2006), who code the answers to this question the following way: 1 (no trust at all), 2 (not very much trust), 3 (some trust) and 4 (a lot of trust). To match the data on international migration, bilateral trust is averaged over the 1970s, the 1980s, and the 1990s.¹¹

The size of immigrant networks established in potential destination countries is approximated with the GBMD migration stocks. More precisely, diaspora are captured with the number of migrants born in country s that live in destination k in period t : $N_{skt} = \log(S_{skt} + 1)$. N_{skt} thus stands for the log stock of migrants at the beginning of the period over which the migration flows are observed. The indicator of geographic distance between two countries measuring the population-weighted distance is provided by Mayer and Zignago (2011).¹² Data on GDP p.c., the binary variable approximating for

<http://zacat.gesis.org/webview/>. The bilateral trust question was asked in the Eurobarometer survey of the years 1970, 1976, 1980, 1983, 1986, 1990, 1991, 1993, 1994, and 1996; see European Commission (1970, 1976, 1980, 1983, 1986, 1990, 1991, 1993, 1994, 1996). In 1996, citizens of 17 European countries were asked to indicate the trust they had in citizens of 25 EU and non-EU countries.

¹¹Decennial migration flows from 1970 to 1980 are regressed on bilateral trust averaged over 1970 and 1976, flows from 1980 to 1990 are regressed on bilateral trust averaged over the years 1980 to 1983, and finally, flows from 1990 to 2000 are regressed on bilateral trust averaged from 1990 to 1996.

¹²The population weighted distance calculates the “distances between two countries based on bilateral

similarities in institutions and the dummy taking the value one whenever two countries share a border come from the CEPII Gravity Dataset generated by Head et al. (2010) and Head and Mayer (2013a). Finally, the common language index measuring linguistic similarities between two countries as well as the indicator of religious similarity are provided by Melitz and Toubal (2014).¹³

Panel A of Table 3.3 present the summary statistics of the sample including all migration flows, and Panel B shows the sample that only includes positive flows. Overall, the sample is composed of 25 European countries and includes observations for the years 1970, 1980, and 1990.¹⁴

3.5 Econometric Strategy

Equation (3.5) is first estimated using an ordinary least squares (OLS) approach. However, estimates resulting from this approach have to be regarded with caution as they might be biased for three main reasons.

First, OLS estimates on bilateral trust could be biased due to potential endogeneity caused either by measurement error, omitted variables or reversed causality. As seen in the previous section, bilateral trust is approximated with a survey based indicator that might measure trust only imperfectly. Additionally, this measure could be correlated with omitted cultural and institutional variables that also affect international migration. To mitigate this mis-specification, a full set of country-year dummies and a vector of dyadic variables is included in the analysis. Yet, this does not guarantee the complete

distances between the biggest cities of those two countries, those inter-city distances being weighted by the share of the city in the overall country's population" (Mayer and Zignago, 2011, p. 11).

¹³Melitz and Toubal (2014) established a dataset including measures of common official language, common spoken language, common native language, linguistic similarity and a common language index that was constructed based on some of these language variables. They can be downloaded from <http://ces.univ-paris1.fr/membre/toubal/papers/Language/lang.html>.

¹⁴The sample includes migration flows for members of the European Economic Area before 1997 and for Norway, Czech Republic, Bulgaria, Hungary, Lithuania, Luxembourg, Poland, Romania, Slovakia, Switzerland, and Ukraine.

Table 3.3: Summary statistics

	Mean	Median	Std. dev.	Minimum	Maximum	N
Panel A: Sample including all international migration flows						
Total migration flows	1,938	417	46,020	-468,323	661,156	627
Female migration flows	926	191	22,425	-219,988	318,058	627
Male migration flows	1,012	215	24,229	-248,335	343,099	627
Average StD trust	2.71	2.71	0.35	1.47	3.65	627
Diaspora (log)	7.98	7.98	2.65	0	14.40	627
Common language index	0.32	0.22	0.20	0.04	1.00	627
Diff. in GDP p.c. (log)	-0.07	-0.01	1.12	-3.07	3.12	627
Distance (log)	6.96	7.01	0.58	5.08	8.13	627
Common border	0.17	0	0.38	0	1	627
Common legal origin	0.27	0	0.44	0	1	627
Religious similarity	0.28	0.23	0.28	0	0.85	627
Somatic distance	2.19	2	1.17	0	5	627

Panel B: Sample including only positive international migration flows

Total migration flows	10,479	1,096	39,146	1	661,156	443
Female migration flows	5,373	640	19,087	1	318,058	427
Male migration flows	5,333	497	21,105	1	343,099	445
Average StD trust	2.74	2.75	0.35	1.47	3.65	445
Diaspora (log)	7.57	7.68	2.51	0	14.40	445
Common language index	0.27	0.18	0.17	0.03	0.88	445
Diff. in GDP p.c. (log)	-0.07	0.00	1.14	-3.07	3.07	445
Distance (log)	6.95	6.99	0.58	5.08	8.13	445
Common border	0.14	0	0.35	0	1	445
Common legal origin	0.22	0	0.42	0	1	445
Religious similarity	0.28	0.23	0.28	0	0.85	445
Somatic distance	2.24	2	1.15	0	5	445

Notes: This table presents the descriptive statistics of the samples used to investigate the relationship between religious similarity of country pairs and international migration. Panel A describes the sample including all international migration flows, including the negative flows. Panel B presents the summary statistics of the sample including only observations that report positive migration flows.

elimination of biases caused by omitted variables. Finally, bilateral trust might also be correlated with the error term because of reversed causality, that is, because international

migration also affects bilateral trust. In the presence of such mis-specifications, causal relationships can be identified with estimation approaches using instrumental variables (IV). Guiso et al. (2009) suggest to instrument bilateral trust with an indicator of somatic distance since DeBruine (2002) showed that physical resemblance enhances trust. This indicator measures physical dissimilarities between average citizens of two populations. It is based on differences between three anthropometric traits: hair colour, cephalic index and height.¹⁵ Information on these traits was published by Biasutti (1959). He classifies the world into five categories of hair colours: 1 (blond prevails), 2 (mix of blond and dark), 3 (dark prevails), 4 (sporadic presence of blond) and 5 (exclusively dark). He further differentiates five categories of average cephalic indexes, going from 71.0 to 86+, and six categories of height. To construct the measure of somatic distance, the score of 1 is assigned to the category corresponding to the lowest average cephalic index (71.0–74.9), 2 to the second category (75.0–78.9), and so on. The six categories of height defined by Biasutti (1959) are coded the same way, assigning the lowest score of 1 to the category "157.9 cm or less" and the highest score of 6 to "178 cm or more". GSZ then compute somatic distance between countries s and d as follows:

$$SD_{sd} = |Hair_s - Hair_d| + |Cephalic_s - Cephalic_d| + |Height_s - Height_d|,$$

that is, SD_{sd} approximates physical dissimilarities by summing the absolute value of the differences in three anthropometric traits. Additionally, they use a measure of religious similarity of country pairs as an instrument for bilateral trust. However, as highlighted by Fehr (2009, p. 259), this instrument might not be valid because "common religion not only influences trust, but does many other things as well, because it is probably associated with more frequent interactions between two countries, compared to cases with different religions". Chapter 4 even finds that religious similarity between country pairs has a

¹⁵The cephalic index measures the shape of a human skull.

direct effect on migration. Therefore, the measure of religious similarity is included in the second-stage of the two-stage least-squared (2SLS) approach, and somatic distance is used as the sole instrument for bilateral trust, exploiting the notion that individuals who look less alike tend to trust each other less.

Second, OLS estimation might suffer from biases caused by heteroscedasticity in the data. Indeed, estimating equation (3.5) with OLS only generates consistent estimates if the conditional variance of z_{st} is independent of the explanatory variables.¹⁶ However, this condition is not satisfied here since migrants are assumed to be systematically different from stayers. According to Santos Silva and Tenreyro (2013, 2011a,b, 2010, 2008, 2006), this type of mis-specification is best addressed with a Poisson Pseudo Maximum Likelihood (PPML) estimator. If the data follows a Poisson distribution, the conditional variance of bilateral migration is proportional to its conditional mean. Therefore, PPML estimates are consistent even in the presence of heteroscedasticity, as long as the conditional mean is correctly specified (Gourieroux et al., 1984; Santos Silva and Tenreyro, 2010; Wooldridge, 2010). This approach also has the advantage to estimate the relationship of interest in its multiplicative form, therefore including observations that report zero migration flows and that are omitted in a logarithmic specification.¹⁷ However, this type of selection should be small here as the sample only includes a few zero flow observations.¹⁸

Third, neither OLS nor PPML estimations include observations that report negative

¹⁶This follows from Jensen's inequality, which states that $E[\log z_{st}] \neq \log E[z_{st}]$. In other words, the expected value of $\log(z_{st})$ does not only depend on the mean of z_{st} but also on higher moments of its distribution. Moreover, if the log-linearisation of the model leads to a non-linear transformation of the disturbances that is not trivial such that $\log E[z_{st}|x] = 0$ but $E[\log z_{st}|x] \neq 0$, OLS yields biased estimates. For a formal illustration of how the presence of heteroscedasticity in the conditional variance of η_{skt} can also affect the consistency rather than only the efficiency of an estimator, see Santos Silva and Tenreyro (2006, p. 644) and Felbermayr et al. (2010, p. 45).

¹⁷Estimating equation (3.5) using OLS omits zero flow observations as the log of zero is undefined.

¹⁸In different settings, this omission can lead to large biases in the estimated parameters, especially when the zero flow observations report "true" zeros, that is, when migration costs are prohibitively high such that no migration is observed (Helpman et al., 2008; Anderson and Yotov, 2010). Zero flows can also be observed because of rounding errors associated with very small migration flows, or they may replace wrongly coded missing values or errors.

migration flows. Yet, they represent approximately 30 percent of total observations. Omitting them is justified when caused by death. Moreover, they are hard to include when they are caused by migration to a third country. However, if negative migration flows capture return migration, then they should be included in the analysis. To do this, migration flows are classified in 10 ordered groups of similar size that regressed in StD trust in addition to other determinants of international migration. This regression is then estimated with an ordered logit model.

The results of these different estimation approaches are presented and discussed in the next section.

3.6 Results

This section briefly revisit the relationship between total migration flows and StD trust before turning to the gender-specific analysis where female and male migration flows are alternatively regressed on StD trust in addition to traditional determinants of international migration.

3.6.1 Bilateral Trust and Total Migration Flows

As this study builds on the previous chapter but uses different data sources, the results presented there are briefly reviewed by re-estimating the relationship between StD trust and total international migration flows. While the data on immigration flows used in Chapter 2 is provided by Ortega and Peri (2009, 2011), total migration flows are here approximated by taking the differences in the total GBMD migrant stocks. The indicators of somatic distance made available by Guiso et al. (2008a) are not employed here as they are less traceable than the ones constructed in Chapter 2. Moreover, the latter allow the

inclusion of a larger country sample in the analysis.¹⁹ Finally, the language measures used in Chapter 2 are replaced by the common language index provided by Melitz and Toubal (2014), who argue that it is preferable to employ this index when the number of countries included in the analysis is small as the variability in the data might not be sufficient to identify the coefficients on several measures of linguistic similarities between country pairs.

The results of estimating equation (3.5) with total migration flows as the dependent variable are presented in Table 3.4. The OLS coefficient on bilateral trust reported in column (1) is negative but not significantly different from zero. This is also the case when bilateral trust is instrumented with different measures of somatic distance. In column (2), bilateral trust is instrumented by an indicator of somatic distance that sums the absolute value of the average difference between two populations in terms of hair colour, height and cephalic index (HHC). In column (3), the somatic distance indicator ignores the distances in the cephalic index (HH). These two indicators were constructed following the instructions given by Guiso et al. (2008a) in an attempt to replicate the measures of somatic distance made available by them. The indicators used to instrument bilateral trust in columns (4) and (5) are similar to the ones used in columns (2) and (3), respectively, only that they additionally allow a country to be home to several categories of traits based on its population density. The magnitude of the IV coefficients on bilateral trust varies across columns, but the estimates are never statistically significant. These results are in line with the ones presented in Chapter 2 as they do not provide any evidence that StD trust affects total bilateral migration flows.

¹⁹Guiso et al. (2008a) only provide data on somatic distance for members of the European Economic Area before 1997 and for Norway. Using data provided in the previous chapter allows me to additionally include the following countries: Czech Republic, Bulgaria, Hungary, Lithuania, Luxembourg, Poland, Romania, Slovakia, Switzerland, and Ukraine.

Table 3.4: The effect of StD trust on total migration flows

	(1)	(2)	(3)	(4)	(5)
Trust (StD)	-0.45 (0.34)	-0.15 (2.66)	-1.71 (2.61)	-1.07 (2.75)	-0.77 (3.04)
Diaspora	0.39*** (0.09)	0.39*** (0.08)	0.39*** (0.09)	0.39*** (0.08)	0.39*** (0.09)
Common language index	0.76 (0.63)	0.67 (1.03)	1.15 (1.16)	0.95 (1.03)	0.86 (1.25)
Distance (log)	-0.24 (0.29)	-0.24 (0.26)	-0.22 (0.26)	-0.23 (0.26)	-0.23 (0.26)
Common border	-0.11 (0.27)	-0.12 (0.24)	-0.10 (0.25)	-0.10 (0.24)	-0.11 (0.24)
Common legal origin	0.33 (0.26)	0.33 (0.24)	0.33 (0.25)	0.33 (0.24)	0.33 (0.24)
Diff. in GDP p.c. (log)	-2.20** (0.94)	1.81* (1.05)	1.34 (1.14)	-0.03 (0.79)	-0.41 (1.70)
Religious similarity	0.19 (0.29)	0.14 (0.46)	0.37 (0.42)	0.28 (0.47)	0.23 (0.48)
<i>Relevance</i>					
K-P rk LM statistic (p-value)		3.30 (0.07)	3.90 (0.05)	3.51 (0.06)	3.02 (0.08)
<i>Weak identification</i>					
K-P rk Wald statistic		3.02	3.64	3.05	2.66
Observations	443	443	443	443	443

Notes: This table reports the results of estimating equation (3.5) with total migration flows as the dependent variable. All columns include country-year dummies. Column (1) presents OLS results. Columns (2) and (3) report IV estimates where StD trust is instrumented with the somatic distance indicators constructed in Chapter 2, following the instructions by Guiso et al. (2008a). In columns (4) and (5), trust is instrumented with measures of somatic distance that also take populations densities into account. These columns are labelled with the letters H and C: H stands for height and hair, and C stands for cephalic index. Estimated standard errors reported in parentheses are clustered at the country pair. Coefficients are statistically different from zero at the ***1%, **5% and *10% level.

3.6.2 Bilateral Trust and Female Migration Flows

To analyse whether StD trust is a gender-specific factor, equation (3.5) is next estimated with female migration flows as the dependent variable. The results of estimating equation

(3.5) with the different approaches presented earlier are reported in Table 3.5.

OLS and IV estimation using somatic distance as an instrument

The OLS coefficient on bilateral trust is reported in column (1) of Table 3.5. It is negative and significantly different from zero at the 10 percent level, contradicting the hypothesis that an increase in bilateral trust fosters female migration flows. However, this significance disappears in column (2) where trust is instrumented with the measure of somatic distance that captures differences in hair colour, height, and cephalic index.²⁰ Yet, the accuracy of this result strongly relies on the validity, that is, on the relevance, strength, and exogeneity of the instrument. Its relevance is tested with the Kleibergen-Paap (K-P) rk LM statistic, which is the efficient first-stage statistic when non-i.i.d. disturbances are assumed. The statistic reported in column (2) suggests that the model is identified, that is, that the instrument is correlated with the endogenous variable.²¹ Indeed, the first-stage coefficient on somatic distance presented in column (3) is significant. However, the magnitude of the coefficient is close to zero, the significance only reaches the 10 percent level, and the Kleibergen-Paap (K-P) rk Wald statistic verifying the strength of the instrument is way below the threshold of 10 recommended in the literature (Staiger and Stock, 1997; Stock et al., 2002). In other words, the instruments seem to be only weakly correlated with StD trust, in which case the IV approach applied in column (2) does not adequately control for potential endogeneity biases.²² Moreover, the exogeneity of somatic distance cannot be tested as it is the only variable used to instrument bilateral

²⁰Instrumenting StD trust with the alternative indicators of somatic distance provided in Chapter 2 yield the same results. The IV coefficient on StD trust is also insignificant when instrumented with the measure of genetic distance made available by Spolaore and Wacziarg (2009).

²¹The null hypothesis is also rejected if I separately instrument StD trust with somatic and genetic distance (results not reported). Rejection of the null hypothesis thus suggests that the instrumental variables are relevant. Indeed, they are significantly different from zero in the first-stage regression (not reported).

²²Estimating the regression with CUE yields the same results. The CUE estimator on StD trust (not reported) is insignificantly different from zero, also suggesting that bilateral trust does not affect international migration.

Table 3.5: The effect of StD trust on female migration flows

	(1) OLS	(2) IV	(3) 1st stage	(4) CUE	(5) PPML	(6) Logit
Trust (StD)	-0.72** (0.35)	-1.11 (2.81)		0.45*** (0.17)	0.35 (0.48)	0.66 (0.31)
Diaspora	0.47*** (0.09)	0.47*** (0.08)	-0.01 (0.01)	0.37*** (0.04)	0.39*** (0.01)	0.77** (0.09)
Common language index	0.38 (0.58)	0.48 (0.90)	0.18 (0.12)	-0.71*** (0.21)	1.79*** (0.67)	1.11 (0.81)
Distance (log)	-0.37 (0.29)	-0.38 (0.28)	-0.01 (0.05)	-0.47*** (0.11)	-0.02 (0.54)	0.32*** (0.11)
Common border	-0.38 (0.31)	-0.39 (0.29)	-0.03 (0.05)	0.08 (0.14)	-0.69* (0.40)	0.41* (0.19)
Common legal origin	0.34 (0.28)	0.35 (0.25)	0.02 (0.04)	0.07 (0.11)	-0.22 (0.47)	1.3 (0.36)
Diff. in GDP p.c. (log)	0.00 (0.21)	3.59 (20.20)	-0.02 (0.04)	8.79*** (2.06)	-0.88** (0.45)	0.50** (0.17)
Religious similarity	0.24 (0.33)	0.29 (0.49)	0.11** (0.05)	0.06 (0.13)	0.79 (0.48)	0.97 (0.41)
Somatic distance			-0.03* (0.01)			
<i>Relevance & weak identification</i>						
K-P rk LM statistic		3.95		182		
(p-value)		(0.05)		(0.34)		
K-P rk Wald statistic		3.63				
<i>Exogeneity</i>						
Hansen J-statistic				169		
(p-value)				(0.60)		
R-squared	0.78		0.78		0.91	
Observations	427	427	427	427	427	627

Notes: This table reports the results of estimating equation (3.5) with international female migration flows as the dependent variable. All columns include country-year dummies. Column (1) presents OLS estimates. In columns (2), StD trust is instrumented with the indicator of somatic distance measuring differences in hair colour, height and cephalic index constructed following Guiso et al. (2008a). Column (3) reports the results of estimating the corresponding first-stage equation. In column (4), trust is instrumented with country pair dummies and estimated with a CUE. PPML and ordered logit estimates are presented in columns (5) and (6), respectively. Estimated standard errors reported in parentheses are clustered at the country pair. Coefficients are statistically different from zero at the ***1%, **5% and *10% level.

trust. Unfortunately, it is very hard to find additional valid instruments. Even a common history of war and genetic distance, two alternative instrumental variable candidates proposed by Guiso et al. (2009), do not pass the statistical tests that verify their validity. Alternatively, the causal relationship between female migration flows and StD trust could be isolated by instrumenting trust with a full set of destination-source dummies, an approach described next.

CUE estimation using bilateral dummies as instruments

Instrumenting bilateral trust with a full set of bilateral dummy variables has the advantage of capturing all observable and unobservable bilateral variables that might affect StD trust. However, this strategy has the disadvantage of strongly increasing the probability of weak identification (Angrist and Pischke, 2009; Hausman et al., 2012). To mitigate this concern, this 2SLS approach is estimated with a continuously updated GMM estimator (CUE) that should yield consistent estimates in the presence of weak instruments.²³ The CUE coefficient on StD trust reported in column (4) of Table 3.5 is positive and statistically significant at the 1 percent level, simultaneously contradicting the OLS and IV results presented in columns (1) and (2), respectively. However, the K-P rk LM statistic suggests that this model is not only weakly identified but that the instruments are irrelevant. In this case, not even a CUE estimator is capable of yielding consistent coefficients. The results presented in equation (4) thus have to be regarded with caution, and further analysis is necessary.

²³Hausman et al. (2011) verify the finite sample properties of the CUE estimator under weak identification. They claim that the estimator might not have finite moments. Ideally, this relationship of interest should be estimated with a heteroscedastic robust version of the Fuller (1977) (HFUL) estimator introduced by Hausman et al. (2012). However, this estimator has not yet been implemented in Stata and programming it would imply considerable effort. In the meantime, the CUE thus seems to be a reasonable alternative to the HFUL as it allows for heteroscedasticity and weak instruments.

PPML estimation: accounting for heteroscedasticity

The contradicting trust estimates in columns (1), (2) and (4) of Table 3.5 could result from the fact that bilateral trust is in reality exogenous to migration.²⁴ Reversed causality is very unlikely as trust is measured at the beginning of the period over which migration flows are observed. Biases caused by omitted variables should be low as the inclusion of bilateral variables and a full set of time-varying source- and destination-country dummies controls for many observable and unobservable determinants of international migration. Finally, Guiso et al. (2009) verify the validity of the trust question asked in the Eurobarometer survey and provide evidence that it should not suffer from measurement error. If bilateral trust is in reality exogenous, then the OLS coefficients are less biased than the IV and CUE estimates. Yet, they might still suffer from biases caused by heteroscedasticity in the data. To address this concern, the model connecting StD trust to female migration flows is estimated in its multiplicative form using a PPML approach. Following equation (3.2) presented in the theoretical part of this chapter, the dependent variable is defined as the total decennial migration flows divided by the total number of stayers.²⁵ The estimation results of regressing this migration share on the explanatory variables is reported in column (5) of Table 3.5. The coefficient on StD trust is positive but not statistically significant, again suggesting that it does not affect female migration flows. However, this approach yields surprising coefficients on the explanatory variables, which suggest, that distance is insignificant and that a common border has a negative effect on female migrations flows. Even more surprisingly, the coefficient on the difference between GDP per capita is negative. These coefficients might suffer from biases caused by the omission of observations reporting negative migration flows, which represent 30 percent of the sample. This point is addressed next.

²⁴Statistical tests that verify the exogeneity of an explanatory variable strongly rely on the existence of valid instruments. If the instruments are not valid, as seems to be the case here, then these tests are not reliable.

²⁵Stayers are individuals who stay in their country of origin instead of moving abroad. Dividing the total decennial migration flows by the population of the source country yields the same PPML results.

Ordered logit estimation: including negative migration flows

To include the negative bilateral migration flows in the analysis, all flows are assigned to 10 ordered groups of similar size. These groups are regressed on StD trust in addition to the other explanatory variables and the equation is estimated with an ordered logit approach. The results of this estimation are presented in column (6) of Table 3.5. The logit coefficient on StD trust is again insignificant, but the coefficients on the explanatory variables are more plausible than their Poisson counterparts presented in column (5). They predict that female migration flows increase with the size of immigrant networks established in destination countries and with differences in GDP per capita. Moreover, female migration flows seem to be larger between countries sharing a national border. Surprisingly, the coefficient on distance suggests that migration flows are higher between countries that are farther apart. As indicated in Table 3.2, this might be the result of the large flows that took place between countries such as France and Poland or Poland and Germany. From 1970 to 2000, many workers from less developed European countries migrated to more developed nations such as Germany, France and Switzerland in search of work. Furthermore, distances within Europe are short and travel costs relatively low; therefore, they are no longer major barriers to migration. Finally, although it is controlled for various bilateral variables as well as for country-year factors affecting migration, it cannot be discounted that distance captures other effects that are excluded from the analysis (Head and Mayer, 2013b).²⁶ Also of interest is that the coefficients on common legal origins and religious similarity are insignificant across all columns (except in the first-stage regression). This might be due to the fact that most European countries have similar formal institutions and the majority of populations adhere to Christian beliefs. Yet, it is still important to include these variables in the regression because they could

²⁶Baldwin and Taglioni (2006) argue that it is difficult to know what the coefficient on distance really measures when a full set of time-varying destination- and source-country dummies is included in the analysis. Yet, as distance is not the main focus of this study, potential biases of its coefficient caused by endogeneity or other mis-specifications are not addressed here.

be correlated with StD trust. If this is the case, excluding them would lead to omitted variable biases.

Further sensitivity analysis

A final concern is that the coefficients on StD trust suffer from biases that are due to multicollinearity. These arise when StD trust is highly correlated with the other explanatory variables included in equation (3.5). For instance, Melitz and Toubal (2014) suggest that indicators measuring linguistic similarity capture ethnic ties and trust between two countries. Head and Mayer (2013b) posit that the measures of distance and a common border proxy for networks that breed familiarity and trust. Finally, as suggested by Guiso et al. (2009), bilateral trust might also be correlated with the institutional and religious similarity of country pairs. If StD trust is highly correlated with one or a combination of these measures, then the inclusion in the specification of both variables might yield misleading parameter estimates.

To address this concern, the correlation coefficients between StD trust and the dyadic variables included in the analysis are estimated. As Melitz and Toubal (2014) suggest that measures of linguistic similarity might capture trust, the different language measures provided by these authors are included in this analysis. The correlation coefficients are presented in Table 3.6. They are all well below one, strongly mitigating the concern of multicollinearity. Only the indicator of common spoken language is moderately correlated with StD trust. This might reflect the fact that a higher probability of speaking the same language facilitates communication and decreases the likelihood of misunderstandings that, in turn, could positively affect bilateral trust. Including this measure of linguistic similarity when estimating equation (3.5) does not change the coefficient on StD trust. Neither does the latter change if the language index is replaced by the additional measures of linguistic similarities provided by Melitz and Toubal (2014) (results not reported).

To further verify that StD trust is not correlated with a combination of dyadic vari-

Table 3.6: Correlation coefficients between StD trust and time-invariant variables

	StD Trust
Diaspora	0.14
Distance	-0.26
Common border	0.05
Common legal origin	-0.09
Diff. in GDP p.c.	0.21
Religious similarity	-0.07
Common language index	0.33
Common official language	0.25
Common spoken language	0.63
Common native language	0.16
Linguistic similarity	0.19

Notes: This table presents the estimated correlation coefficients between the time-invariant variables included in equation 3.5 as well as between StD trust and the measures of linguistic proximity of country pairs provided by Melitz and Toubal (2014).

ables, StD trust is regressed on the time-invariant factors. Estimating this equation using OLS yields an R-squared of 0.47, which is far below the value of one indicating the presence of multi-collinearity.

Overall, the results presented in this additional sensitivity analysis confirm the previous results, that is, that the trust in citizens of a potential host countries does not affect international female migration flows.

3.6.3 Bilateral Trust and Male Migration Flows

To analyse whether StD trust affects international male migration flows, the dependent variable in equation (3.5) is now composed of male decennial migration flows. Although the previous section casts doubt on the validity of the two-stage approaches, they are still applied here in order to be consistent and to make the results for female and male migration flows comparable. Therefore, Table 3.7 presents the results of estimating the relationship between StD trust and male migration flows using OLS, IV, CUE, PPML

and Logit.

Table 3.7: The effect of StD trust on male migration flows

	(1) OLS	(2) IV	(3) 1st stage	(4) CUE	(5) PPML	(6) Logit
Trust (StD)	-0.01 (0.40)	-2.24 (2.37)		-0.66*** (0.16)	0.47 (0.34)	0.56 (0.28)
Diaspora	0.35*** (0.09)	0.33*** (0.09)	-0.01 (0.01)	0.22*** (0.03)	0.50*** (0.01)	0.74** (0.09)
Common language index	0.79 (0.65)	1.54 (1.07)	0.25** (0.11)	0.71*** (0.16)	1.71*** (0.58)	1.99 (1.46)
Distance (log)	-0.25 (0.27)	-0.21 (0.26)	0.04 (0.05)	0.06 (0.09)	-0.19 (0.47)	0.33*** (0.12)
Common border	-0.14 (0.28)	-0.08 (0.27)	0.02 (0.05)	0.59*** (0.10)	-0.40 (0.29)	0.37** (0.19)
Common legal origin	0.48** (0.24)	0.48** (0.23)	0.01 (0.04)	0.54*** (0.10)	-0.25 (0.46)	1.42 (0.44)
Diff. in GDP p.c. (log)	0.09 (0.21)	-15.62 (15.13)	0.01 (0.04)	-4.07 (5.02)	-0.45* (0.27)	0.32*** (0.11)
Religious similarity	0.08 (0.32)	0.43 (0.45)	0.13** (0.05)	0.24** (0.10)	0.43 (0.42)	1.56 (0.69)
Somatic distance			-0.03** (0.01)			
<i>Relevance & weak identification</i>						
K-P rk LM statistic		4.64		191		
(p-value)		(0.03)		(0.53)		
K-P rk Wald statistic		4.43				
<i>Exogeneity</i>						
Hansen J-statistic				183		
(p-value)				(0.38)		
R-squared	0.77		0.79	0.24	0.92	
Observations	445	445	445	445	445	627

Notes: This table reports the results of estimating equation (3.5) with international male migration flows as the dependent variable. All columns include country-year dummies. OLS, PPML and logit estimates are presented in columns (1), (2) and (3), respectively. Estimated standard errors reported in parentheses are clustered at the country pair. Coefficients are statistically different from zero at the ***1%, **5% and *10% level.

In column (1) of Table 3.7, equation (3.5) is estimated using OLS. This approach

yields an insignificant coefficient on StD trust that is very close to zero, suggesting that trust does not affect male migration flows. This is consistent with the results found in columns (2), (5) and (6) which show the IV, PPML and Logit estimates, respectively. Although the magnitude of the trust coefficients varies across these columns, the estimates remain significantly different from zero. Only the CUE estimate on StD trust reported in column (4) is significant, suggesting that trust has a negative effect on male migration flows. However, this approach again seems to be invalid as the country pair dummies used as instruments neither pass the test that verifies their relevance nor the one that verifies their exogeneity.

The results presented in Table 3.7 follow a similar pattern to the one observed in Table 3.5 for female migration flows. It is not surprising that neither of the two-stage approaches pass the tests that verify their validity here either, but it is interesting to observe that the CUE estimates are the only highly significant coefficients on trust in both settings. Moreover, no matter whether focusing on male or female migration flows, the OLS coefficients take negative values while the PPML and Logit approaches yield positive—although insignificant—estimates. However, in the context of male migration flows, neither of the plausible approaches yields a significant coefficient on StD trust. The results presented here thus do not provide any evidence that StD trust affects male migration flows taking place within Europe.

3.7 Concluding Remarks

This chapter analysed whether bilateral trust is a gender-sensitive determinant of international migration. As women are found to be more risk-averse than men and to endure more stress when moving abroad, trust in the citizens of potential destination countries might be of particular significance for female migrants while being negligible for men. The aim of this chapter was thus to disentangle the potentially heterogeneous effects of

StD trust on female and male migration flows.

To perform this analysis, a structural equation was derived from a RUM model that allows stayers to be systematically different from migrants, and the dependent variable was alternately defined as the total, female or male bilateral migration flows. These flows were regressed on the indicator of StD trust provided by the Eurobarometer surveys and on other traditional determinants of international migration.

When focusing on total migration flows, the coefficients on StD trust were always insignificant. Although different datasets and a larger country sample were used here, these results are similar to the ones found in Chapter 2 and are consistent with its conclusion that StD trust does not affect average migration, that is, migration flows aggregated across gender.

The picture is less clear when turning to female migration. Estimating its determinants using OLS, the coefficient on StD trust is significant but negative. This suggests that increased trust in the citizens of the destination country reduces female migration flows. Yet, this surprising result is not robust: the significance disappears when applying an IV approach that instruments StD trust with an indicator of somatic distance, and the trust coefficient even becomes significantly positive when applying a CUE approach. Yet, these two-stage estimators do not pass the standard statistical tests that verify the relevance and exogeneity of the instruments used to capture the exogenous part of trust. Therefore, the IV and CUE coefficients on StD trust have to be regarded with caution. The relationship between female migration flows and StD trust is additionally estimated using a PPML and a Logit approach. These have the advantages of yielding robust estimates even in the presence of heteroskedastic data and of allowing the inclusion of negative migration flows, respectively. Both approaches yield positive but insignificant trust coefficients. As the two-step approaches cannot be trusted and the OLS results are most likely biased because of their inconsistency in the presence of heteroscedasticity and truncation, the most plausible results are the ones found using the PPML and Logit

approaches that both yield insignificant coefficients on StD trust. Overall, the results hence contradict the hypothesis that StD trust might be particularly important for potential female migrants. On the contrary, they even suggest that trust does not affect the location choices of women.

The results are very similar when focusing on male migration flows. According to the statistical tests, the two-stage approaches are not valid as their instruments neither seem to be relevant nor exogenous. The other approaches, that is, the OLS, PPML and Logit approaches, all yield coefficients on StD trust that are not significantly different from zero. In other words, they do not provide evidence in favour of the hypothesis that inter-regional trust matters for international male migration flows.

Overall, the estimations thus do not support the hypothesis that StD trust is a gender-specific determinant of international migration. However, these results notwithstanding, one should be very careful when concluding that trust does not matter for international migration in general. This study focuses on bilateral migration flows within Europe, where countries share many cultural traits and have similar historical and institutional backgrounds. Ideally, this analysis should be extended to migration flows taking place between more diverse countries but, unfortunately, data on bilateral trust necessary for such an analysis does not yet exist. Therefore, this analysis is left for future research.

Chapter 4

How does Religious Similarity Affect International Migration?

4.1 Introduction

This chapter investigates whether religious similarity between two countries affects international migration. Religion is a central element in the formation of individual and social identities, and still shapes cultural traditions today (Kinnvall, 2004; Wellman and Tokuno, 2004). By affecting the values, morals and behaviour of individuals, it promotes cultural proximity between country pairs which in turn might increase international migration by facilitating the integration and assimilation of immigrants in the destination country. This point is in line with the prediction of the behavioural model developed by Akerlof and Kranton (2000, 2010), according to which the utility of individuals decreases when they move to countries that proscribe behavioural rules that differ from the ones they internalised.

Religious similarity between two countries might also affect international migration by providing newcomers with religious networks that are already well established in the host country. This can reduce migration costs by supporting immigrants in their search

for housing and employment or by providing them with places where they can interact with people who were born or who have already settled in the destination country. Additionally, religious networks provide newcomers with psychological and spiritual support. International migration is often described as a destabilising process that causes anxiety and feelings of intensified insecurity (Hirschman, 2004). In such situations, religious identification is shown to play a particularly important role in the well-being of immigrants as it gives them a sense of belonging and improves their self-esteem.¹

Some of these practical and spiritual services might also be offered by ethnic-religious institutions established in the destination country (Levitt, 2003, 2004; Diehl and Koenig, 2013). The extent to which such institutions exist and how much newcomers benefit from their services depends on the age and the size of immigrant communities. Indeed, van Tubergen (2013) shows that old and large diaspora often include well-established ethnic-religious institutions that attract newcomers because they provide services that are tailored to their specific needs. On the contrary, immigrants coming from new source countries do not have access to such institutions and are less embedded in ethnic-religious networks. Therefore, religious similarity between country pairs is suspected to be more important for the latter as they do not benefit from broad immigrant networks that could facilitate their moving and integration process. Equivalently, this would mean that potential destination countries with large diaspora communities are more attractive for migrants who do not share their majority religion.

This chapter thus examines two questions: Does religious similarity between country pairs affect international migration? Does the effect of religious similarity depend on the size of immigrant communities existing in the destination country? The estimation approach employed to address these questions is derived from a random utility maximisation (RUM) model. This derivation reveals that the estimation of the specification of interest

¹See Smith (1978), Ebaugh and Chafetz (2000), Ebaugh (2003), Kinnvall (2004), Wellman and Tokuno (2004), Lim and Putnam (2010), Ysseldyk et al. (2010), Olson (2011), and Connor (2012).

might suffer from endogeneity biases if it is not correctly controlled for multilateral resistance to migration, that is, for the fact that a location choice depends on the migration frictions between the source country and all potential destination countries (Bertoli and Moraga, 2013). To address this problem, time-varying country dummies are included in the specification. Other econometric challenges are the potential heteroscedasticity of the data and the high frequency of observations reporting zero migration flows. Santos Silva and Tenreyro (2006, 2008, 2011a) use Monte Carlo simulations to assess the validity and performance of alternative empirical methods in the presence of such data. They provide evidence that the Poisson Pseudo Maximum Likelihood (PPML) estimator is to be preferred over alternative estimators as it is less subject to biases resulting from heteroscedasticity and truncation. In light of this evidence, the gravity-type equation derived in this chapter is estimated using a PPML approach.

To do this, international migration flows are approximated by taking the difference between migration stocks made available by the Global Bilateral Migration Database (GBMD). They are regressed on standard explanatory variables of international migration, such as distance and common language, on an indicator of religious similarity, a variable capturing the size of diaspora, and on the interaction between these two variables. Religious similarity between country pairs is approximated using a binary variable that takes the value one whenever two countries share the majority religion and zero otherwise. This indicator relies on data provided by the World Religion Database.

The results predict that bilateral migration rates between two countries sharing the majority religion are on average 136 percent higher than between countries having different religious backgrounds. As expected, this effect decreases with the size of diaspora, suggesting that religious similarity is particularly important for individuals moving to countries with small immigrant communities. Moreover, the results reveal that international migration increases with the size of diaspora, which is in line with the findings published by Beine, Docquier and Ozden (2011). According to the Poisson estimates,

a 1 percent increase in the size of diaspora leads to an increase in bilateral migration rates of 0.50 percent when countries share the majority religion and to an increase of 0.58 when they have different religious backgrounds. The existence of immigrant networks in the host country hence seems to be slightly more important for migrants originating from countries that do not share the destination's majority religion. Finally, these significant results highlight the importance of including religious similarity between country pairs in specifications analysing migration patterns, especially since the traditional dyadic variables do not adequately account for cultural factors.

This study is related to several strands of literature. First, it draws on papers in sociology and social psychology that have long recognised the important role that religion plays for immigrants. Second, the theoretical model is based on the income maximisation approach originated by Roy (1951)² and relates to studies in migration literature that highlight the importance of controlling for multilateral resistance to migration. Third, the empirical specification is close to the gravity-type frameworks used in recent papers analysing various determinants of migration.³ Finally, the estimation approach is related to recent contributions in the econometric literature that verify the consistency and efficiency of various estimates in the presence of heteroscedasticity in the data and truncation.

The rest of the chapter is organised as follows. The next section gives an overview of the literature. Section 4.3 presents the theoretical framework used to analyse the relationship between the religious similarity of country pairs and international migration, from which the econometric specification is derived. The estimation approaches and the data used to estimate this specification are presented in sections 4.4 and 4.5, respectively. Section 4.6 reports the main results, and their robustness is verified in section 4.7. The

²See for instance Sjaastad (1962), Anderson (1979), and Borjas (1987, 1989, 1994, 1999).

³Among others, see Clark, Hatton, and Williamson (2007), Pedersen, Pytlikova, and Smith (2008), Mayda (2010), Beine, Docquier and Ozden (2011), Grogger and Hanson (2011), Ortega and Peri (2012), and Beine and Parsons (2012).

last section concludes and proposes future avenues of research.

4.2 Related Literature

Religion has long been ignored by economic scholars as it was viewed to be a purely private matter that is only likely to reach ignorant, uninformed and irrational individuals (Stark and Finke, 2000).⁴ This situation did not change after Max Weber (1904–1921 [2006]) posited that religious factors are main drivers of economic development. He claimed that the Protestant Reformation favoured the rise of modern capitalism in Western Europe by breaking with Catholic traditions, particularly with its sacrament of penance. According to Weber, the Protestant ethic improved personal traits, such as work ethic and discipline, and introduced rationalisation in all areas of life.⁵ This, in turn, led the Western economies down the path of modernisation. However, Weber also claimed that religion is condemned to disappear in response to rationalisation and economic development:

The tension between religion and intellectual knowledge definitely comes to the force wherever rational empirical knowledge has consistently worked through to the disenchantment of the world and its transformation into a causal mechanism. [...] Every increase of rationalism in empirical science increasingly pushes religion from the rational into the irrational realm. (Weber, 1946, p. 350–1)

The hypothesis that religion is rooted in irrationality and is doomed to disappear is known as the secularisation thesis (Wilson, 1966; Berger, 1969). This thesis was largely supported by sociologists and psychologists until the first half of the 20th century. However, since then it has been increasingly criticised as being mainly the result of ideological

⁴See also Stark et al. (1996) for an overview of intellectuals living in the 19th and 20th centuries who considered religious adherence to be the outcome of an irrational choice.

⁵The Calvinistic concept of predestination and the quest for salvation encouraged Protestants to behave rationally in order to experience economic success (Kaufmann, 1997).

debates that are not supported by facts.⁶ Indeed, consistent empirical evidence showing that religious beliefs decline with modernisation is missing. Religion is rather observed to be persistent and even to have revived in many countries over the last decades.⁷ Moreover, Iannaccone, Finke and Stark (1997) find that countries with similar levels of economic development can experience different religious trends. For example, while religious beliefs declined in Sweden to reach low levels of religious mobilisation, religious participation increased in the United States. The authors argue that the secularisation thesis is unable to predict these different evolutions because it focuses merely on the demand for religion and fails to consider the empirical evidence that suggests that different religious participation rates rather reflect shifts in the supply of religious activities. In order to take into account both demand-side and supply-side factors, Bainbridge, Finke, Iannaccone and Stark published various studies in which they develop a theory of religious markets.⁸ On the demand side, this theory is in line with the microeconomic models of Azzi and Ehrenberg (1975) and Ehrenberg (1977), which predict that individuals allocate time and money to religious and secular activities based on the maximisation of inter-temporal utility functions.⁹ On the supply side, religious services are assumed to be produced by churches and offered on a competitive market. In order to attract adherents, the services provided by a given church thus have to be of good quality and have to match the de-

⁶There is a large body of literature rejecting the secularisation thesis. See, among others, Martin (1965), Shiner (1967), Greeley (1972), Hadden (1987), Warner (1993), Stark et al. (1996), and Iannaccone (1998). For a good overview, see Stark and Finke (2000).

⁷For example, a resurgence of religious adherence has been observed in the United States (Finke and Stark, 1992; Warner, 1993) and in Latin America (Martin, 1990; Stoll, 1990), challenging the secularisation thesis. As Iannaccone (1998, p. 1466) emphasises, “the resurgence of evangelical Christianity in the United States, the rise of Islamic fundamentalism in the Middle East, the explosive growth of Protestantism in Latin America, the religious ferment in Eastern Europe and the former Soviet Union, the role of religion in political and ethnic conflicts worldwide - all testify to religion’s pervasive and continuing importance”.

⁸To mention only a few studies, see Bainbridge and Stark (1979), Iannaccone (1991), Finke and Stark (1992), Finke and Iannaccone (1993), Stark and Iannaccone (1994), Stark et al. (1996), and Stark and Finke (2000). Stark and Finke (2000) give a good overview of the studies developing the theory of religious markets that were published, among others, by Bainbridge, Iannaccone, Finke and Stark.

⁹In other words, it predicts that the consumption of religious services depends on the opportunity costs of time and money. An inter-temporal utility function is a function that takes into account both lifetime and after-life utility (Azzi and Ehrenberg, 1975).

mand. Otherwise, individuals consume the goods and services offered by other religious or secular firms. Moreover, the theory on religious markets suggests that government intervention can affect participation rates in religious activities by changing the market conditions. According to Iannaccone et al. (1997), the vibrant church attendance in the United States finds its origin in the first amendment of the U.S. Constitution, which introduced religious freedom and created a highly competitive religious market characterised by religious pluralism. The opposite situation is observed in Sweden because public financial support of the Lutheran church resulted in a monopolistic religion market, giving no incentives to the Lutheran state church to provide adequate and efficient services to its adherents (Stark and Iannaccone, 1994).¹⁰

The religion market model introduces a new perspective as it refutes the secularisation thesis and shows that religious participation is a persistent phenomenon that can be the outcome of a rational choice. This new perspective gives rise to a growing number of studies trying to uncover links between religion and economic outcome. Some of these studies support some aspects of the hypothesis of Max Weber as they suggest that religion affects economically important behaviour, such as education (Becker and Woessmann, 2009; Boppart, Falkinger, Grossmann, Woitek, Wüthrich and Gabriela, 2013; Boppart, Falkinger and Grossmann, 2014) and fertility (Lehrer, 1996), by influencing personal beliefs and characteristics.¹¹ Others suggest that religion increases economic activity by providing members of the same congregation with a similar system of values and moral conduct.¹² This similarity might promote cultural proximity and trust

¹⁰For a critical discussion of the religious market model, see McCleary (2011b). More precisely, see Chapters 1, 7, and 13 written by Rachel McCleary, Daniel Olson and Daniel Hungerman, respectively.

¹¹Education and fertility are just two examples of many. It has also been analysed whether religion affects marriage, divorce, suicide, drug consumption and mental and physical health, to mention only a few. For a broader overview of empirical studies analysing the link between religion and individual behaviour, see Iannaccone (1998) and more recently Lehrer (2011) and Ysseldyk et al. (2010).

¹²According to Ebaugh and Chafetz (2000, p. 21), congregations “indicate, very broadly, groupings of people who gather together for religious purposes and who create an ongoing structure in which to worship, share a religious tradition, interact as a group, and attempt to raise their children with specific religious beliefs, customs, rituals, and values”.

among individuals, which in turn facilitates cooperation (Tajfel and Turner, 1979; Greif, 1993; Putnam, 1993; Greif, 1994, 2006; Fukuyama, 1995; Iannaccone, 1998; Alesina and La Ferrara, 2002; Tabellini, 2008). Following this reasoning, recent empirical studies find that religious similarity between two countries increases international trade (Guo, 2004; Helble, 2007) and promotes foreign direct investment (Hergueux, 2012) by reducing transaction costs. In addition, I posit that religious similarity also affects international migration by promoting cultural proximity and by offering services that can facilitate potential migrants' integration in the host country. To the best of my knowledge, this relationship has not yet been explicitly analysed in economic studies.

Since the second half of the 20th century, scholars in sociology and social psychology recognised the importance of religion in the moving and assimilation process. As already hinted, religion is an important driver for individual and social identity formation (Kinnvall, 2004; Wellman and Tokuno, 2004). It has shaped cultures and affects daily interactions still today, even in more secular countries (Kaufmann, 1997). However, each religion has its doctrine, ideology, and rituals, which prescribe beliefs and behavioural rules that can be very different from one religion to the next (Iannaccone, 1998). As most religions claim to possess the universal truth, they often exhibit a certain degree of intolerance towards people or groups who do not share their ideas (Levitt, 2003). This can lead to tensions when immigrants carry along religious and cultural traditions that are not shared by the majority of the population in the host country (Kinnvall, 2004; Wellman and Tokuno, 2004; Roman and Goschin, 2011). For instance, comparing Muslim Turks and Catholic Poles who migrated to predominantly Catholic Germany, Diehl and Koenig (2013) show that Turks face more discrimination because, contrary to Poles, they cannot just become "a little less religious" (p. 13) in order to assimilate. In such situations, international migration can be a disruptive experience that gives immigrants a feeling of insecurity and vulnerability. As Hirschman (2004, p. 1210) emphasises:

Immigrants become strangers in a new land with the loss of familiar sounds,

sights, and smells. The expectations of customary behaviour, hearing one's native language, and support from family and friends can no longer be taken for granted. Even the most routine activities of everyday life - shopping for food, working, and leisure time pursuits - can be alienating experiences for many new immigrants who find themselves in strange settings that require constant mental strain to navigate and to be understood.

Kinnvall (2004) claims that such traumatic events are likely to lead to existential anxiety as they challenge the identity and self-esteem of migrants. Giving them a sense of belonging in a foreign environment, religious identification is suspected to be particularly important for the well-being of immigrants (Smith, 1978; Lim and Putnam, 2010; Ysseldyk et al., 2010; Connor, 2012; Olson, 2011). Ebaugh and Chafetz (2000, p. 18) emphasise that "religion is not only a central element in the maintenance of ethnic identity among immigrants, but it may well be more important for their identity than was true in their homelands, where religion is often taken for granted." The increased importance of religious identification in times of intensified insecurity is suspected to result from its monolithic and abstract nature.¹³ Kinnvall (2004, p. 758) argues that religious identification is "the *one* stable identity that answers to the need for securitized subjectivity. With its very long history, this monolithic "entity" becomes a stabilizing anchor in an otherwise chaotic and changing world, linking the past and the present to future actions."

The religious similarity of country pairs might thus affect international migration by promoting cultural similarity, thereby decreasing the psychological and emotional challenge that a resettlement can represent. In economics, Akerlof and Kranton (2000) formalise this point by developing a behavioural model where the utility function decreases due to "losses in identity" (p. 719).¹⁴ To capture those losses, a person's utility depends

¹³See Smith (1978) for anecdotal evidence that religious identification was salient for the assimilation of European immigrants moving to America during the 19th century and the beginning of the 20th century. More recently, see Freeman (2003), who claims that religious, national and ethnic identities are salient, that is, that they have pre-eminence over other social identities.

¹⁴See also Akerlof and Kranton (2010).

not only on her own behaviour but also on the behaviour of others and the behaviour that a group or a society prescribes to its members. More precisely, Akerlof and Kranton suggest that anxiety and losses in utility are the result of a person's attempt to assimilate or integrate in a society that prescribes a different behaviour than the one that was internalised, and even if "those with non distinguishing physical features may be able to "pass" as a member of another group [...] others will be constrained by their appearance, voice, or accent." (p. 726). The authors further emphasise that "much conflict occurs because people with different prescriptions or identities come into contact. To avoid conflict and losses in utility, people may want to match with those who share the same identity or for whom actions have the same meaning" (p. 731). As religion is an important cultural component that affects the identity and behaviour of people, the model suggests that religious similarity between country pairs reduces the probability that an immigrant's utility decreases because of losses in identity, which in turn might promote international migration.

Religious similarity between the home and host countries could also affect international migration by providing immigrants with large networks that help them satisfy practical and economic needs (Cadge and Ecklund, 2007; Aleksynska and Chiswick, 2011). Newcomers have to find housing, search for employment and deal with bureaucracy in order to obtain all the immigration-related papers. Some have to improve their language skills and others need to find a school for their children. Churches, synagogues, temples, mosques or other sites of religious participation are trustworthy institutions that assist immigrants in these processes. They also provide places where immigrants can interact with other members. This can further ease integration in the host country by giving them access to an even broader social network (Ebaugh and Chafetz, 2000).

Some of these practical and spiritual services might also be offered by immigrant networks established in the destination country. Beine et al. (2011) find that international migration depends on the size of such diaspora. By providing newcomers with

networks composed of immigrants who are already established in the host country, they find that the existence of such immigrant communities promotes international migration by increasing the availability and the quality of information about migration opportunities. Furthermore, Freeman (2003) emphasises that individuals often have difficulties in separating national and religious identities.¹⁵ As these identities generally intertwine, diaspora often embed ethnic-religious institutions because, once established in the host country, immigrants practice their own rituals that satisfy their ethnic-specific demand for religion. As these institutions offer services in the mother tongue and keep familiar forms of worship, even immigrants sharing the majority religion of the host country might prefer them over established local congregations (van Tubergen, 2013; Diehl and Koenig, 2013). In this case, diaspora not only alleviate informational frictions as suggested by Beine et al. (2011), but they also provide immigrants with religious organisations that can help them through the migration and assimilation processes. Moreover, according to Levitt (2003, 2004), such ethnic-religious institutions are generally connected to their communities of origin, representing transnational religious organisations that can further facilitate international migration. Analysing religious attendance among different immigrant groups in the Netherlands, van Tubergen (2013) finds that immigrants coming from new source countries (Poland and Bulgaria) are less embedded in ethnic-religious networks than immigrants who belong to larger and more well-established groups (Turks, Moroccans, Surinamese and Antilleans). The author concludes (p. 723):

Conditional upon pre-migration religiousness [...] both the well-established Muslim group from Turkey and Morocco and the well-established, predominantly Christian, groups from Suriname and the Antilles show more religious continuity in the Netherlands than the recent Muslim immigrants from Bulgaria and the Christian immigrants from Poland. Thus, rather than pre-

¹⁵See also Ebaugh and Chafetz (2000, p. 401) who argue that “ethnicity is frequently determined by an immigrant’s identification with a particular religious tradition more than by any other factor, such as language, feelings of nationalism, or belief in a common descent.”

dominant religious affiliation in the home country, the relevant distinction for religious continuity is the size and history of the immigrant community in the Netherlands. The stronger continuation of pre-migration religiosity among immigrants who belong to the larger and older groups could be the result of stronger protection to assimilative forces, i.e. the larger ethnic networks promote the religious monitoring of co-ethnics and protect them against the more secular Dutch norms and practices. Considering religious practices, another possible explanation is that the religious market is better adapted to the demands of the immigrants from the older and larger groups, as these groups have been in Holland for a longer period and are numerically far larger than the “new” group.

According to van Tubergen, immigrant communities can thus embed protective religious networks that provide religious services tailored to the specific needs of their members. However, how well these networks are established and how much immigrants benefit from their services depends on the age and the size of the immigrant communities. Following this reasoning, the migration-promoting effect of religious similarity between country pairs should be higher for migrants moving to countries with small immigrant networks. Equivalently, potential destination countries with large diaspora should be more attractive for migrants who do not share the host countries’ majority religions. In order to shed some light on this point, this chapter also looks at the interaction between religious similarity and the size of such diaspora.

To resume, I posit that religious similarity between source and destination countries increases international migration by promoting cultural proximity between country pairs and by providing newcomers with economic and social support. I argue that this effect is especially important for people moving to countries with small immigrant communities, depending on the size of diaspora established in the destination country. This chapter hence examines two questions. First, it analyses the relationship between the religious

similarity of country pairs and international migration, and, second, it verifies whether and how this relationship depends on the size of the immigrant networks. The theoretical framework used to perform this analysis is described in the next section.

4.3 Theoretical Considerations

This section first derives the theoretical framework that builds on the models presented in Chapters 2 and 3. More precisely, it is again based on a random utility maximisation (RUM) model that assumes that potential migrants only move abroad if the expected migration benefits exceed the expected migration costs. However, the framework presented here goes a step further in the generalisation of the distributional assumption. Whereas the previous models only accounted for heterogeneity within source countries, the model used in this chapter additionally allows for spatial correlation in the random part of utility. In other words, it does not only assume that migrants are systematically different from stayers but also allows for destination countries to be viewed as close substitutes by potential migrants.

After deriving the theoretical model, this section discusses potential determinants of international migration flows, including the possible role of religious similarity between country pairs and its interaction with the size of immigrant networks established in destination countries.

4.3.1 A RUM Model allowing for Multilateral Resistance to Migration

The individual location choice problem faced by potential migrants is derived from a RUM model where an individual i from country s who can choose her preferred location

d among a set of n countries D has the following location-specific utility:¹⁶

$$U_{sd}^i = V_{sd} + \epsilon_{sd}^i \quad \forall d, \quad (4.1)$$

where V_{sd} represents the deterministic component of the utility obtained by an inhabitant in s from opting for location d , and ϵ_{sd}^i accounts for the unobserved individual-specific part of utility that is treated as being random. Among the n possible locations included in D , individual i is expected to choose the one that yields the highest utility (Roy, 1951).

To illustrate this point, suppose that individual i from country s has two alternatives: staying at home or moving to country k . In this case, migration is only observed if the average utility of living abroad is greater than the utility derived from staying at home, that is, if it holds that $U_{sk}^i > U_{ss}^i$. The probability that an individual chooses to move from country s to country $k \neq s$ instead of staying at home can then be written as:

$$\begin{aligned} P_{sk}^i &= P(U_{sk}^i > U_{ss}^i) \\ &= P(V_{sk} + \epsilon_{sk}^i > V_{ss} + \epsilon_{ss}^i) \\ &= P(\epsilon_{ss}^i - \epsilon_{sk}^i < V_{sk} - V_{ss}). \end{aligned} \quad (4.2)$$

As individual i faces a set of potential locations, this decision problem yields a vector of choice probabilities $\mathbf{P}_s^i = (P_{s1}^i, \dots, P_{sn}^i)$ that depend on the distributional assumptions about the random component in equation (4.1). Following McFadden (1974, 1976), these choice probabilities can be described using a conditional logit model if the stochastic term ϵ_{sd}^i is assumed to be independently and identically distributed with a type I extreme value distribution.¹⁷ In this case, the logistic choice probability that location k is chosen over

¹⁶Bilateral migration is observed over time. However, for simplicity, I omit the time subscript here. It will be included in the end of this sub-section.

¹⁷This is because the difference of two extreme value variables follows a logistic distribution. To see how different distributional assumptions lead to different discrete choice models, see Train (2009) and Wooldridge (2010, Ch. 16).

an alternative set of locations is given by:¹⁸

$$P_{sk}^i = \frac{e^{V_{sk}}}{\sum_d e^{V_{sd}}}, \quad (4.3)$$

where $\sum_d e^{V_{sd}}$ sums the deterministic utilities of all potential alternatives $d \in D$, including the utility derived from staying at home and that derived from moving to destination k . The individual logit choice probabilities take values between zero and one, and they sum to one: $\sum_{k=1}^n P_{sk}^i = 1$. This implies that individual i necessarily chooses one location and that the probability of choosing destination k over location s neither depends on the existence nor on the characteristics of alternative destinations. Formally, this can be seen by looking at the ratio of two logit probabilities:

$$\frac{P_{sk}^i}{P_{ss}^i} = \frac{e^{V_{sk}} / \sum_d e^{V_{sd}}}{e^{V_{ss}} / \sum_d e^{V_{sd}}} = \frac{e^{V_{sk}}}{e^{V_{ss}}} = e^{V_{sk} - V_{ss}}, \quad (4.4)$$

where the term $\sum_d e^{V_{sd}}$ drops, suggesting that the individual choice between locations k and s is indeed independent of any alternative destination. This property is known as the *independence from irrelevant alternative* (IIA) property, which gives rise to proportional substitution patterns.¹⁹ Moreover, the distributional assumption made to derive the conditional logit model implies that the attractiveness of a potential destination k is identical for all origin countries and for all individuals within those countries (Bertoli and Moraga, 2013). The model thus does not allow for any type of unobserved heterogeneity. Therefore, the IIA axiom is only satisfied when the model is specified correctly, that is, when the deterministic part of utility includes all determinants capturing correlations

¹⁸For derivation, see Appendix 1.

¹⁹Suppose there are three countries labelled A , B and C . Country A and B are close substitutes. If the attractiveness of country A declines, then the IIA assumption implies that migrants who previously moved to country A are allocated to the two remaining countries such that the relative choice probabilities remain unchanged (Falaris, 1987; Train, 2009). However, if A and B are close substitutes, I would expect most of these migrants to move to country B . To take this possibility into account, countries will be grouped in nests (see hereafter). The conditional logit model was used, among others, to analyse how bilateral migration is affected by changes in immigration policies (Clark et al., 2007; Mayda, 2010), networks (Pedersen et al., 2008), and skill-related differences in earnings (Grogger and Hanson, 2011).

between alternative locations such that the stochastic term of utility only captures white noise (Train, 2009, p. 39).

Such restrictive properties are not plausible when analysing international migration patterns, as limited data availability often impedes the inclusion in the model of all relevant determinants of location-specific utility. This is problematic, first because it is unlikely that potential migrants of the same origin all have identical preferences. Take Switzerland, which has four official languages (French, German, Italian and Romansh) as an example. A Swiss-German might have higher utility from moving to Germany than a Swiss-French or a Swiss-Italian. Second, the relative probability of choosing location k over location s generally depends on the attractiveness of alternative destinations, which also violates the IIA property. This should be especially true when two alternative locations are perceived as close substitutes by potential migrants.²⁰ Suppose individual i originating from s is indifferent between moving to Germany or Switzerland. In this case, already a small change in the attractiveness of Germany—induced, for example, by an increase in wages or a change in immigration policies—might redirect flows from Switzerland to Germany. The fact that the decision to move from a country s to a location k depends on the migration frictions between them relative to the average impediments these two countries have with all alternative destination countries is known as “multilateral resistance to migration” (Bertoli and Moraga, 2013).²¹

To address these concerns, Ortega and Peri (2012, p. 8) allow for unobserved individual heterogeneity within source countries: “Our migration model extends Grogger and

²⁰As mentioned by McFadden (1974, p. 113), “The primary limitation of the model is that the independence of irrelevant alternative axiom is implausible for alternative sets containing choices that are close substitutes.” See also McFadden (1976, p. 369): “The multinomial logit model combined with the results relating to the random utility model is particularly appealing in applications because of computational advantages and consistency with a theory of sampling from a population of classical utility-maximising consumers. The primary drawback of this formulation is that it ignores some of the structural aspects of choice which makes the independence from irrelevant alternatives property inappropriate in some applications. As pointed out by Debreu (1960), the strict utility model predicts too high a joint probability of selection for two alternatives which are in fact perceived as “similar” rather than “independent” by the subject.”

²¹For an analogue in the trade setting, see Anderson and van Wincoop (2003, p. 176).

Hanson (2011) by allowing for unobserved individual heterogeneity between migrants and non-migrants. It is plausible that migrants systematically differ from non-migrants along important dimensions that are hard to measure, such as ability, risk aversion and the psychological costs of living far from home.” They account for this type of unobserved heterogeneity by including time-varying origin-country dummies in their specification. According to Bertoli and Moraga (2013), this is only sufficient to restore the IIA property and to make the specification of Ortega and Peri (2012) consistent with the underlying RUM model if the unobserved individual heterogeneity affects all destination countries identically. As this is unlikely to be true, Bertoli and Moraga (2012) further relax the distributional assumption by grouping destination countries into “nests”. Potential migrants perceive any two alternative destination countries belonging to the same nest as close substitutes (McFadden, 1984; Train, 2009). If a nest is composed of only one country, then this nest, respectively the country belonging to the nest, is called a singleton. In their empirical example analysing how immigration policies and networks affect bilateral migration flows, Bertoli and Moraga (2012) assume that the source countries are singletons in order to account for heterogeneity within these countries, and they partition the destination countries into six subsets (six nests) in order to reduce cross-sectional dependence.

In a recent publication, Bertoli and Moraga (2013) go a step further in their attempt to generalise the distributional assumption of the stochastic component of utility. They use a Generalised Extreme Value generating function that allows destination countries to be allocated not only to one but simultaneously to J different nests $\{b_1, \dots, b_J\}$, indexed by $j = 1, \dots, J$. They derive the following individual choice probabilities:

$$P_{sk}^i = \sum_{j=1}^J P_{sk|b_j}^i P_{sb_j}^i = \frac{\sum_j (\alpha_{skj} e^{V_{sk}})^{1/\tau} \left(\sum_{d \in b_j} (\alpha_{sdj} e^{V_{sd}})^{1/\tau} \right)^{\tau-1}}{\sum_j \left(\sum_{d \in b_j} (\alpha_{sdj} e^{V_{sd}})^{1/\tau} \right)^{\tau}},$$

where $P_{sk|b_j}^i$ is the probability that individual i originating from country s chooses location

k conditional on opting for a location belonging to nest b_j and $P_{sb_j}^i$ is the probability that the same individual chooses a location that is in nest b_j . $\alpha_{skj} \in [0, 1]$ is known as the “allocation parameter” that allocates the location k to the J different nests and $\tau \in [0, 1]$ as the “dissimilarity parameter” that measures the degree of correlation in unobserved utility among the locations within the subgroups (Bertoli and Moraga, 2013; Wen and Koppelman, 2001; McFadden, 1981, 1978).²² If $\tau = 1$, then there is no correlation and the model simplifies to the conditional logit model seen previously. As τ approaches zero, the within-nest (spatial) correlation in the random part of utility increases. Taking the ratio of two choice probabilities yields:

$$\frac{P_{sk}^i}{P_{ss}^i} = \frac{\sum_j (\alpha_{skj} e^{V_{sk}})^{1/\tau} \left(\sum_{d \in b_j} (\alpha_{sdj} e^{V_{sd}})^{1/\tau} \right)^{\tau-1}}{\sum_j (\alpha_{ssj} e^{V_{ss}})^{1/\tau} \left(\sum_{d \in b_j} (\alpha_{sdj} e^{V_{sd}})^{1/\tau} \right)^{\tau-1}}, \quad (4.5)$$

where $\left(\sum_{d \in b_j} (\alpha_{sdj} e^{V_{sd}})^{1/\tau} \right)^{\tau-1}$ allows location decisions between two countries to depend on the characteristics and existence of alternative destinations d belonging to the same nest b_j while the stochastic part of the utility of two alternatives belonging to different nests are assumed to be independent. Bertoli and Moraga (2013) further make the assumption that the source country s is a singleton. Adding time subscripts, equation (4.5) can then be re-written as:²³

$$\frac{P_{skt}^i}{P_{sst}^i} = \frac{\sum_j (\alpha_{skj} e^{V_{skt}})^{1/\tau} \left(\sum_{d \in b_j} (\alpha_{sdj} e^{V_{sdt}})^{1/\tau} \right)^{\tau-1}}{e^{V_{sst}}} = \frac{(e^{V_{skt}})^{1/\tau}}{e^{V_{sst}}} \eta_{skt}, \quad (4.6)$$

where

²²See Train (2009) for a simple explanation of nested logit models.

²³As explained by Bertoli and Moraga (2013, p. 82), if s is a singleton then “there is a nest b_j such that $\alpha_{ssj} = 1$ and $\alpha_{sdj} = 0$ for all $d \in D$ ”. Note that indexes in the citation have been changed to match the notation in this chapter.

$$\eta_{sk} = \sum_j (\alpha_{skj})^{1/\tau} \left(\sum_{d \in b_j} (\alpha_{sdj} e^{V_{sdt}})^{1/\tau} \right)^{\tau-1},$$

captures multilateral resistance to trade as it “captures the influence exerted by the opportunities (and barriers) to migrate to other destinations upon migration from country s to country k at time t ” (Bertoli and Moraga, 2013, p. 82).²⁴ As individual choice probabilities can be aggregated and approximated with frequencies (Train, 2009), the average probability that potential migrants originating from s choose destination k over destination s in period t can then be re-written as:

$$\frac{M_{skt}}{M_{sst}} = \frac{(e^{V_{skt}})^{1/\tau}}{e^{V_{sst}}} \mu_{skt}, \quad (4.7)$$

where $\mu_{skt} = \eta_{skt} z_{skt}$ and z_{skt} captures the error of approximating probabilities, M_{skt} counts the number of individuals born in country s who choose location k in period t and M_{sst} represents those who choose to stay at home in the same period.

4.3.2 The Determinants of International Migration Flows

The representative utility is generally assumed to take a linear function of its determinants. The utility of individuals staying at home (V_{ss}) is typically assumed to depend on the characteristics of the home country, such as prevailing wages, climate and existing welfare systems:

$$V_{sst} = \lambda_{st}, \quad (4.8)$$

where λ_{st} captures these source-country specific characteristics that can vary over time. Similarly, the representative utility of living abroad depends on the characteristics of the host country k and on the moving, assimilation and integration costs that individuals

²⁴The indexes in the citation have been changed to match the notation used in this chapter.

face when migrating to a foreign country $k \neq s$:

$$V_{skt} = \lambda_{kt} - g(\mathbf{X}_{sk}, R_{skt}, N_{skt}), \quad (4.9)$$

where λ_{kt} stands for the time-varying country-specific characteristics of destination k and $g(\mathbf{X}_{sk}, R_{skt}, N_{skt})$ captures the bilateral migration costs. While λ_{kt} affects all immigrants similarly, independently of their origin, migration costs are specific to a given country pair. Indeed, bilateral migration frictions, such as the magnitude of physical moving costs and policy-based migration barriers, vary from one destination to another, leading to different bilateral costs. These costs are generally approximated with bilateral time-invariant control variables, such as a measure of geographical distance and dummies that take the value one whenever two countries share a border, when they have the same official language, the same legal origins or a common colonial history. These traditional dyadic variables are included in vector \mathbf{X}_{sk} . Furthermore, these migration costs are allowed to depend on religious similarity between country pairs (R_{skt}), the size of diaspora established in a destination country (N_{skt}) and the interaction of these two variables ($R_{skt} * N_{skt}$). If, as suspected, religious similarity lowers migration costs by promoting cultural proximity between country pairs and by providing newcomers with networks, there should be evidence in favour of $g_R < 0$.²⁵ Similarly, if the size of a diaspora lowers migration costs by improving the information flows between the source and the destination countries, then there should be evidence in favour of $g_N < 0$. Finally, if the cost-reducing effect of religious similarity decreases with the size of immigrant networks, or vice versa, then there should be evidence in favour of the hypothesis that the effect of religious similarity on the utility of migrating to another country decreases based on the size of the diaspora, that is, $g_{RN} > 0$. Bilateral migration frictions are thus specified to

²⁵ g_R denotes the partial derivative of g with respect to R and g_N with respect to N ; g_{RN} is the cross derivative.

take the following functional form:

$$g(\mathbf{X}_{skt}, R_{skt}, N_{skt}) = \mathbf{X}_{skt}'\gamma + \beta_1 R_{skt} + \beta_2 N_{skt} + \beta_3 R_{skt} * N_{skt}. \quad (4.10)$$

Substituting equations (4.8) to (4.10) into equation (4.7) and rearranging terms yields the following constant-elasticity model:

$$\frac{M_{skt}}{M_{sst}} = \exp (\beta_1 R_{skt} + \beta_2 N_{skt} + \beta_3 R_{skt} * N_{skt} + \mathbf{X}_{skt}'\gamma + \lambda_{kt}/\tau + \lambda_{st})\mu_{skt}, \quad (4.11)$$

which is estimated using the empirical approaches described in the next section. According to the previous discussion, we expect the following signs of the estimated coefficients: $\beta_1 > 0$, $\beta_2 > 2$ and $\beta_3 < 0$.

4.4 Empirical Strategy

A conventional estimation procedure involves taking the logarithm of equation (4.11) to obtain:

$$\log (M_{skt}/M_{sst}) = \beta_1 R_{skt} + \beta_2 N_{skt} + \beta_3 R_{skt} * N_{skt} + \mathbf{X}_{skt}'\gamma + \lambda_{kt}/\tau + \lambda_{st} + \mu_{skt}. \quad (4.12)$$

However, this estimation approach suffers from two main limitations. First, estimating equation (4.12) using OLS only generates consistent estimates if the conditional variance of μ_{skt} is independent of the explanatory variables.²⁶ As discussed in the previous section, this condition is not satisfied when analysing international migration patterns because

²⁶This follows from Jensen's inequality, which states that $E[\log \eta_{skt}] \neq \log E[\eta_{skt}]$. In other words, the expected value of $\log (\eta_{skt})$ not only depends on the mean of η_{skt} but also on higher moments of its distribution. If the log-linearisation of the model leads to a non-linear transformation of the disturbances that is not trivial, such that $\log E[\eta_{skt}|x] = 0$ but $E[\log \eta_{skt}|x] \neq 0$, OLS cannot be used as it would yield biased estimates. For a formal illustration of how the presence of heteroscedasticity in the conditional variance of η_{skt} can also affect the consistency rather than only the efficiency of an estimator, see Santos Silva and Tenreyro (2006, p. 644) and Felbermayr et al. (2010, p. 45).

multilateral resistance to migration leads to serially and spatially correlated error terms. Mayda (2010) addresses this problem by constructing an explanatory variable that measures the weighted average GDP per capita of all the alternative destinations included in her sample. Bertoli and Moraga (2012) address it by including origin-year dummies in their specification that interact with nest dummies. Bertoli and Moraga (2013) go a step further by estimating their model using the Common Correlated Effects (CCE) estimator proposed by Pesaran (2006) and Pesaran and Tosetti (2011).²⁷ This estimator allows accounting for unobserved heterogeneity at all levels because it can control for spatial and serial correlation in the error terms and permits a broad and flexible structure of nests. However, the CCE approach cannot be applied here because it requires a dataset with a large time dimension. Moreover, Bertoli and Moraga (2013) take the log of bilateral migration rates, which leads to the exclusion of all zero observations. This is also the second main limitation of the approach that estimates equation (4.12) using OLS, as it leads to a highly selective omission of observations and to potentially severe biases, especially when the omitted observations provide valuable information about why zero migration is observed (Anderson and Yotov, 2010; Helpman et al., 2008).²⁸ A common response to this problem is to add one to the dependent variable and regress $\log(y + 1)$ on the covariates of y .²⁹ However, Santos Silva and Tenreiro (2006) provide evidence that the results obtained using this estimation approach are also misleading. Using Monte Carlo

²⁷As Bertoli and Moraga (2013, p. 80) explain, “Pesaran (2006) proposed an estimator, the Common Correlated Effects (CCE) estimator, which allows to derive consistent estimates from panel data when the error follows this structure, i.e. it is serially and spatially correlated, and the regressors are endogenous. The CCE estimator requires to estimate a regression where the cross-sectional averages of the dependent and of all the independent variables are included as auxiliary regressors: consistency of the estimates follows from the fact that the multilateral resistance to migration term can be approximated by a dyad-specific linear combination of the cross-sectional averages.”

²⁸Zero observations can result from rounding errors associated with very small migration flows, or they may reflect wrongly coded missing values or errors. However, they can also represent the “true” absence of migration due to the fact that migration costs are too high. Omitting these true zeros leads to the loss of valuable information and, thereby, to potentially large biases in parameter estimates. See, for example, Head et al. (2010), who verify the robustness of their OLS estimates with a PPML approach.

²⁹See, for example, Eichengreen and Irwin (1995, 1998) and more recently, Felbermayr and Kohler (2006).

simulations, they assess the validity and performance of alternative empirical methods that truncate or perform a non-linear transformation of the dependent variable.³⁰ They find that the PPML estimator is generally less subject to bias resulting from heteroscedasticity and rounding errors than the other estimators under analysis. Another advantage that follows from modelling the error terms as generated from a Poisson distribution is that the conditional variance of the dependent variable is proportional to its conditional mean. In other words, the data does not have to follow a Poisson distribution nor does the dependent variable have to be an integer. The only condition required for the PPML estimator to be consistent is that the conditional mean is correctly specified (Gourieroux et al., 1984; Santos Silva and Tenreyro, 2010; Wooldridge, 2010).

Martinez-Zarzoso, Nowak-Lehmann and Vollmer (2007) and Martin and Pham (2008) challenge the results published by Santos Silva and Tenreyro (2006). They criticise the idea that the data-generating process used by the latter only generates zero observations that result from rounding errors associated with very small trade flows. But in practice, zero observations in data on international trade and migration may also reflect wrongly coded missing values or errors and, more importantly, they can reflect the true absence of international trade or migration between country pairs due to the fact that transaction costs are too high. As mentioned earlier, omitting these “true” zeros leads to the loss of valuable information and thereby to potentially large biases in parameter estimates. To verify whether the PPML estimator also behaves well when the zero observations have alternative origins, Martinez-Zarzoso et al. (2007) and Martin and Pham (2008) perform Monte Carlo simulations using mechanisms to generate zeros that are different from the ones used by Santos Silva and Tenreyro. Martin and Pham (2008) generate a latent

³⁰Santos Silva and Tenreyro (2006) use Monte Carlo simulations to verify the validity of the following estimation approaches: Non-Linear Least-Squares, Gamma Pseudo Maximum Likelihood, OLS of the log linear model, OLS when the depend variable is $y_i + 1$, PPML, the threshold Tobit of Eaton and Tamura (1994), and a truncated OLS. Moreover, they define four different forms of heteroscedasticity in order to test how robust these estimation approaches are. They also verify how the performance of the estimators change in the presence of rounding errors. Follow-up papers that further analyse the validity of PPML estimation are Santos Silva and Tenreyro (2010, 2011a).

variable taking the form $y^* = y - k$, which is set to zero if its value is negative. Using this censored regression, they find that the standard threshold-Tobit estimator performs better than the PPML estimator, as long as it is correctly controlled for heteroscedasticity. When randomly generating zero observations, Martinez-Zarzoso et al. (2007) find that the PPML estimator still performs well in the presence of a high frequency of zeros, as long as the sample size is large. Otherwise, they recommend using a feasible generalised least squares estimator, which seems to outperform PPML when the sample is small.

Santos Silva and Tenreyro study these concerns and provide further simulation evidence that PPML estimators are suited to estimate constant-elasticity models as long as the user verifies that the maximum likelihood exists for the parameters of interest (Santos Silva and Tenreyro, 2008, 2010, 2011a,b). Indeed, the PPML estimator can have difficulties converging in some situations, namely when the dataset has a high frequency of zero observations, when the model contains many fixed effects, when the values of the dependent variables are large and when the covariates are highly correlated or have different scales.³¹ However, Santos Silva and Tenreyro propose simple solutions that solve these problematic situations, such that the PPML procedure still converges and consistently estimates the parameters of a constant-elasticity model in a variety of circumstances.

In light of the evidence provided by Santos Silva and Tenreyro, it has become common in recent empirical literature to estimate gravity-type equations first in their logarithmic form and to compare resulting OLS coefficients to their PPML counterparts that are more consistent in the presence of heteroscedasticity and zero outcome observations. This is also the approach adopted here, as Guimaraes et al. (2003, 2004) and Schmidheiny and Brulhart (2011) verified that Poisson estimation complies with choice models derived from individual utility maximisation. In order to address the potential violations of the IIA assumptions discussed earlier, two versions of the location-choice model introduced in section 4.3 are estimated. First, a full set of origin-year and destination-year dum-

³¹See also the “The log of gravity” page at <http://privatewww.essex.ac.uk/~jmcass/LGW.html>.

mies is included in the estimated specification. The former capture all observable and unobservable time-varying origin-specific characteristics that might promote or hinder migration flows, and they also control for heterogeneity in individual propensities to migrate (Bertoli and Moraga, 2012, 2013). Destination-year dummies restore spatial (cross-sectional) independence in the residuals and account for the time-varying characteristics of host countries that might affect international migration.³² However, by including a full set of destination-year dummies, the variability in the data used for identification is strongly reduced.³³ To address this point, the set of potential host countries is partitioned into different nests based on geographical and economic (GDP per capita) proximity and the regression is re-run, replacing destination-year dummies with nest fixed effects.³⁴ The data used to perform this analysis is described next.

4.5 Data

The data on international migration comes from the Global Bilateral Migration Database (GBMD) collected by Ozden, Parson, Schiff, and Walmsley (2011).³⁵ This unique database includes data on bilateral migration stocks between approximately 230 source and destination countries for the years 1960, 1970, 1980, 1990 and 2000. The GBMD is the migration database with the largest coverage and it is, so far, the only one to include a complete set of information on South-South migration. It thus allows one to proxy

³²This approach is close to the one applied in the trade literature where researchers have to control for multilateral resistance to trade in order to have an unbiased estimation of parameters.

³³As highlighted by Bertoli and Moraga (2012, p. 26), there is a clear trade-off between identification power and correct specification: “Finer nests [...] run the risk of saturating the model and losing much of the identification power in the data. In the limit, the finest partition, which is represented by single-destination nests, ensures cross-sectional independence but delivers no identification in the cross section as they would be equivalent to origin-destination fixed effects.”

³⁴Destination countries are assigned to different nests based on the country classification of the United Nations Statistics Division (2013). More precisely, they are classified based on their geographic location, their economic situation (developed, transition, developing, least developed), whether they export fuel and whether they are small island developing states.

³⁵The GBMD can be downloaded from the following Internet page of The World Bank: <http://data.worldbank.org/data-catalog/global-bilateral-migration-database>.

bilateral migration flows for a large country sample. These proxies are obtained from computing $M_{skt} = S_{skt+1} - S_{skt}$, where S_{skt+1} and S_{skt} stand for the bilateral migration stocks in years $t + 1$ and t , respectively, made available by the GBMD. M_{skt} hence captures the decennial gross migration flows between two countries.³⁶ Almost 60 percent of the observations report zero migration flows, 90 percent have migration flows below 160 and only 1.5 percent report flows above 10,000. Only the six observations reported in Table 4.1 have decennial migration flows larger than one million.

Table 4.1: Decennial migration flows larger than one million

Origin	Destination	Year	Decennial Migration flows	M_{skt}/M_{sst}
Mexico	USA	1970–1980	1,472,078	0.03
Mexico	USA	1980–1990	2,253,731	0.03
Mexico	USA	1990–2000	4,705,677	0.06
Turkey	Germany	1970–1980	1,211,576	0.04
Romania	Germany	1980–1990	1,070,597	0.05
Bangladesh	India	1970–1980	4,577,227	0.07

Source: Global Bilateral Migration Database.

The bilateral migration stocks provided by the GBMD are also used to approximate diaspora and the native population. Diaspora are approximated by the number of migrants born in country s that live in destination k in year t : $N_{skt} = \log(S_{skt} + 1)$. N_{skt} hence stands for the log stock of migrants at the beginning of the period over which I compute the migration flows. The proportion of the native population that stays at home is approximated following Beine and Parsons (2012), that is, by computing:

$$M_{sst} = Pop_{st} - \sum_{k=1}^D S_{kst},$$

where Pop_{st} is the total population of country s in year t (natives and foreigners) made

³⁶Note that this proxy only observes the changes in migration stocks. It does not give any information about the distribution over time or about the origin of these changes. For example, it gives no indication of whether negative bilateral migration flows are caused by return migration, death, and/or migration to a third country.

available in the Penn World Tables (Heston, Summers and Aten, 2012). $\sum_{d=1}^D S_{kst}$ captures the foreigners living in country s , independently of their origin k . The population born in country s that stays at home (M_{sst}) is thus approximated by subtracting the stock of foreigners in s from its total population.

Religious similarity between two countries is captured with a dummy variable that takes the value one whenever two countries have the same majority religion, and zero otherwise. The “majority religion” is the religion that unites the largest part of the population in a country for a given year. The data used to construct this binary variable comes from the World Religion Database (WRD). It is edited by Johnson and Grim (2008), provides data for the years 1900, 1950, 1970 and 2000 and reports the national distribution of population for every country in the world according to the following religious affiliations: Muslim, Christians, Baha’is, Hindus, Agnostics, Buddhists, Zoroastrians, Ethno-religionists, Sikhs, Atheists, Jews, Shintoists, Confucianists, Chinese Folk-religionists, New Religionists, Spiritists, Jains and Daoists. If the majority religion for a given country is the same in 1950, 1970 and 2000, it is assumed that this was also the prevailing religion in 1960, 1980 and 1990. Note that this proxy captures the religious similarity between two countries at the beginning of the period over which bilateral migration flows are observed.³⁷

The remaining variables included in \mathbf{X}_{sk} —the variable measuring the weighted distance between two countries and the dummy variables taking the value one whenever two countries share a border, have a common colonial history, share the official language and have the same legal origin—come from the CEPII Gravity Dataset generated by Head, Mayer and Ries (2010) and Head and Mayer (2013a).

The descriptive statistics of the samples used to analyse the relationship between

³⁷This dummy variable is chosen to proxy the religious similarity of country pairs because it should not suffer from endogeneity bias caused by reversed causality. This is not necessarily the case when religious similarity is approximated with a Herfindahl index measuring the probability that a randomly chosen individual from country s has the same religion as a randomly chosen individual from country k .

Table 4.2: Summary statistics

Variable	Mean	Std. dev.	Min	Max	N
Panel A: Non-negative bilateral migration flows (with zero observations, estimation with PPML)					
Migration flows	980	24,457	0	4,705,677	115,683
Native population (ths)	19,300	78,800	9	1,150,000	115,683
Migration rate	0.0002	0.0041	0	0.5295	115,683
Diaspora	1.20	2.29	0	15.38	115,683
Religious similarity (RS)	0.46	0.50	0	1	115,683
RS*Diaspora	0.70	1.92	0	15.38	115,683
Distance (log)	8.85	0.74	4.15	9.89	115,683
Common language	0.16	0.37	0	1	115,683
Colony	0.01	0.10	0	1	115,683
Common legal origin	0.29	0.46	0	1	115,683
Common border	0.01	0.10	0	1	115,683
Panel B: Positive bilateral migration flows (without zero observations, estimation with OLS)					
Migration flows	2,688	40,444	1	4,705,677	42,184
Native population (ths)	35,200	116,000	9	1,150,000	42,184
Migration rate	0.0006	0.0068	0	0.5295	42,184
Diaspora	3.13	2.87	0	15.38	42,184
Religious similarity (RS)	0.53	0.50	0	1	42,184
RS*Diaspora	1.84	2.81	0	15.38	42,184
Distance (log)	8.55	0.88	4.15	9.89	42,184
Common language	0.20	0.40	0	1	42,184
Colony	0.02	0.15	0	1	42,184
Common legal origin	0.34	0.47	0	1	42,184
Common border	0.03	0.16	0	1	42,184

Notes: This table presents the descriptive statistics of the samples used to estimate the relationship between the religious similarity of country pairs and bilateral migration rates, and to analyse whether this effect depends on the size of immigrant networks established in the destination country. Panel A includes all observations reporting non-negative migration flows. It is the sample used to estimate the relationship of interest in its multiplicative form with PPML. Panel B drops all zero migration flow observations and presents the sample used to estimate equation (4.12) with OLS. The data and its sources are described in section 4.5.

bilateral migration rates and the religious proximity of country pairs are presented in Table 4.2. The sample includes observations for approximately 230 countries for the years 1960, 1970, 1980, and 1990. Panel A of Table 4.2 presents the summary statistics of the sample, including all observations reporting non-negative migration flows. This sample

is used when applying the PPML approach. As almost 60 percent of these observations report zero migration flows, the sample strongly decreases when estimating equation (4.12) using OLS. The sample including only positive migration flows is described in Panel B of Table 4.2.

4.6 Results

The results of estimating the relationship between the religious similarity of country pairs and bilateral migration rates using OLS and PPML are presented in Table 4.3. Both approaches find that migration costs captured with the distance between two countries or with proxies for linguistic and legal similarity have significant effects on migration flows that go in directions typically observed in the data. The coefficients on religious similarity, on diaspora in the destination country and on the interaction of these two variables are also significant but their magnitude varies across columns.

Column (1) of Table 4.3 presents the results of estimating equation (4.12) using OLS. The positive and highly significant coefficient on religious similarity predicts that migration rates between two countries sharing the majority religion are on average 40 percent higher than between countries having different religious backgrounds.³⁸ The results also predict that bilateral migration flows increase with the size of diaspora established in the destinations. More precisely, they suggest that a 1 percent increase in the size of immigrant networks increases migration rates on average by 0.76 percent. This effect is similar to the ones published by Beine et al. (2011), who find OLS coefficients on diaspora that lie between 0.62 and 0.83. As expected, regressing the logarithm of bilateral migration

³⁸For a correct interpretation of the coefficients of dummy variables in a semilogarithmic regression model see Halvorsen and Palmquist (1980), Kennedy (1981), and Giles (1982), or more recently Van Garderen and Shah (2002) and Giles (2011). These studies conclude that the estimator by Kennedy has computational advantages and that it is very close to the unbiased estimator as long as the sample size is reasonably large. I therefore adopt this estimator. Given a coefficient of 0.34 and a standard error of 0.03, this yields a difference in predicted bilateral migration flows of approximately $\hat{\beta}_1 = 100 * [\exp(0.34 - (0.03)^2/2) - 1] = 40.4$ percent.

Table 4.3: The effect of religious similarity on international migration

	(1) OLS	(2) PPML	(3) PPML	(4) PPML	(5) PPML
Religious similarity (RS)	0.34*** (0.03)	0.53*** (0.19)	0.87*** (0.16)	0.74*** (0.19)	
RS*Diaspora	-0.07*** (0.01)	-0.04* (0.02)	-0.08*** (0.02)	-0.08 (0.03)	
Diaspora	0.76*** (0.01)	0.54*** (0.04)	0.58*** (0.03)	0.59*** (0.04)	0.53*** (0.03)
Distance (log)	-0.34*** (0.01)	-0.46*** (0.08)	-0.67*** (0.09)	-0.55*** (0.08)	-0.69*** (0.09)
Common language	0.26*** (0.03)	0.32*** (0.08)	0.44*** (0.09)	0.39*** (0.13)	0.48*** (0.09)
Colony	0.01 (0.06)	0.34** (0.15)	0.60*** (0.16)	0.52*** (0.20)	0.57*** (0.17)
Common legal origin	0.07*** (0.02)	-0.00 (0.07)	0.26*** (0.07)	0.23** (0.11)	0.23*** (0.08)
Contiguity	0.15** (0.06)	0.10 (0.11)	0.10 (0.13)	-0.05 (0.19)	0.12 (0.14)
Observations	42,184	42,184	104,676	115,683	104,676
R-squared	0.86	0.86	0.84	0.57	0.83
Source-year fixed effects	Yes	Yes	Yes	Yes	Yes
Destination-year fixed effects	Yes	Yes	Yes	No	Yes
Destination-nest fixed effects	No	No	No	Yes	No

Notes: Column (1) reports the results of estimating equation (4.12) using OLS. The dependent variable is the natural logarithm of bilateral migration rates (Global Bilateral Migration Database) for the years 1960, 1970, 1980 and 1990. Columns (2) and (3) report PPML coefficients that result from estimating the relationship of interest in its multiplicative form. In these columns, the dependent variables are the bilateral migration rates. Column (2) only uses the sub-sample of positive migration flows, and column (3) also includes zero migration flow observations. Religious similarity (World Religion Database) is a dummy variable that takes the value one when two countries have the same majority religion. Estimated robust standard errors are reported in parentheses, which are clustered at source-nest pairs. Coefficients are statistically different from zero at the ***1%, **5% and *10% level.

rates on the interaction between religious similarity and the size of diaspora yields a negative coefficient that is significantly different from zero at the 1 percent level. This might reflect the fact that larger immigrant networks embed ethnic-religious institutions that offer services tailored to a given immigrant group, thereby decreasing the cost-reducing

effect that religious similarity has on international migration. Alternatively, this negative coefficient on the interaction term might reflect that the size of diaspora has a greater effect on immigration flows that take place between two countries with different religious backgrounds. This is in line with Diehl and Koenig (2013), who show that Muslim Turks moving to predominantly Catholic Germany are more integrated in immigrant networks than Catholic Poles. As Muslim Turks are less familiar with the cultural and religious background of the host country, the authors suspect that they also face more discrimination, in which case immigrant networks take the role of a refuge where newcomers with different religious traditions are protected from assimilation pressures coming from the mainstream culture.³⁹

As mentioned earlier, the estimates reported in column (1) have to be regarded with caution, as estimating equation (4.12) using OLS omits all observations that report zero migration flows. This strongly decreases the number of observations included in the analysis because only 40 percent of the sample exhibits positive migration flows. Thus, the OLS approach might not only yield biased coefficients because of potential heteroskedasticity in the data but also because of this truncation. In order to separately examine these sources of mis-specification, column (2) reports the PPML estimates using only the sub-sample of positive migration flows and column (3) shows the Poisson coefficients for the sample including zero-flow observations. Compared to the OLS estimates, the Poisson coefficients on religious similarity are about 1.6 and 2.6 times larger in columns (2) and (3), respectively, suggesting that heteroscedasticity as well as truncation cause OLS estimates to be biased. In column (2), the PPML approach predicts that bilateral migration rates between countries sharing the majority religion are on average 67 percent higher than between countries with different majority religions. Including observations reporting zero migration flow in column (3) even yields Poisson estimates on religious

³⁹A more precise interpretation of the interaction term and its implication for the effect of religious similarity and diaspora is made later in this chapter, when the model is estimated with PPML.

similarity, which suggests that this effect increases to 136 percent. As for the coefficients on the size of diaspora, they are still highly significant in columns (2) and (3) but decrease by almost 24 percent when estimated using PPML. The results suggest that the diaspora coefficients mainly suffer from biases due to heteroscedasticity. They predict that a 1 percent increase in the size of diaspora leads to an increase in bilateral migration rates between 0.54 and 0.57 percent. Finally, the coefficient on the interaction between religious similarity and diaspora decreases and is only significant at the 10 percent level in column (2). However, when including zero migration flows in the analysis, the magnitude of the coefficient on the interaction term becomes significant at the 1 percent level and increases to a slightly higher level than in column (1).

The coefficient on the interaction term can be interpreted in two different ways. First, it might suggest that diaspora has a larger effect on migration flows taking place between countries with different religious backgrounds: column (3) of Table 4.3 predicts that a 1 percent increase in the size of diaspora leads to an increase in migration rates of 0.50 percent when countries share the majority religion and of 0.58 percent when they have different religious backgrounds. Second, the coefficient on the interaction term suggests that the effect of religious similarity depends on the size of immigrant networks. For instance, the results presented in column (3) predict that the coefficient on religious similarity is equal to 0.87 in the absence of diaspora, is equal to 0.77 when the size of diaspora is at its mean and is equal to -0.36 when diaspora takes the maximum value.⁴⁰ The last coefficient is surprising because it not only suggests that religious similarity between two countries becomes less important as the size of diaspora increases but that

⁴⁰As the size of diaspora is a continuous variable, there is also a continuous number of coefficients on religious similarity that can be computed the following way:

$$\frac{\partial \left(\frac{M_{skt}}{M_{sst}} \right)}{\partial R_{skt}} = \beta_1 + \beta_3 * N_{skt}.$$

Recall that N_{skt} measures the log of bilateral migration stocks. It has a sample mean of 1.2 and takes values between 0 and 15.38.

religious similarity even has a negative effect on bilateral migration rates when immigrant networks are large. However, the results presented in column (3) do not say anything about the significance of the different coefficients on religious similarity. In order to make a statement about their significance, the model needs to be re-parametrised (Wooldridge, 2010, p. 197). More precisely, the variable capturing the size of diaspora (N_{skt}) in equation (4.11) has to be replaced by $N_{skt} - \mu_N$ in the interaction term to obtain:

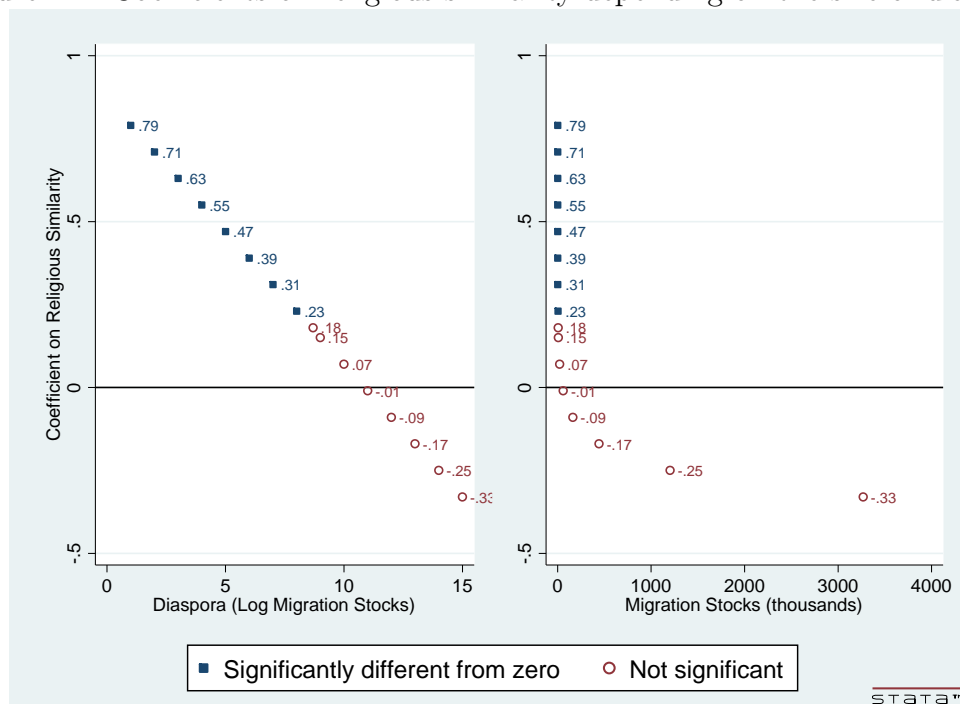
$$\frac{M_{skt}}{M_{sst}} = \exp (\beta_1 R_{skt} + \beta_2 N_{skt} + \delta_1 R_{skt} * (N_{skt} - \mu_N) + \mathbf{X}'_{sk} \gamma + \lambda_{kt} + \lambda_{st}) \eta_{skt}, \quad (4.13)$$

where $\delta_1 = \beta_1 + \beta_2 \mu_N$ and μ_N can take any value of N_{skt} . Estimating this equation directly yields coefficients capturing the effect that religious similarity has on bilateral migration rates when the size of diaspora is equal to μ_N and, more importantly, it reports useful standard errors that indicate whether the estimated effect is significantly different from zero or not.⁴¹ The Poisson coefficients on religious similarity that result from estimating equation (4.13) at different sizes of diaspora are displayed in Figure 4.1. Consistent with previous results, they suggest that bilateral migration rates are significantly higher between countries sharing the majority religion than between countries having different religious backgrounds. They also confirm that this effect decreases with the size of diaspora. Additionally, the results presented in Figure 4.1 suggest that religious similarity becomes insignificant as soon as the stocks of immigrants reach approximately 6,000 individuals. However, more than 98 percent of observations report migration stocks below this threshold. Religious similarity hence seems to significantly affect migration flows of almost all observations included in the sample.

Comparing the PPML coefficients presented in Table 4.3 to estimates reported in column (1), the results further suggest that the coefficients on the traditional dyadic

⁴¹ Additionally, estimating equation (4.13) has the advantage of yielding standard errors that can be used to compute the partial effect that religious similarity has on the dependent variable using the estimator by Kennedy (1981).

Figure 4.1: Coefficients on religious similarity depending on the size of diaspora



variables also suffer from biases due to heteroscedasticity and selection when estimated using OLS. The Poisson coefficient on the (log) distance between two countries is almost twice as large as the corresponding OLS estimate. It suggests that a 1 percent increase in the distance reduces bilateral migration rates by 0.67 percent. The same is observed for the binary variable taking the value one when two countries share the same official language: its coefficient almost doubles when increasing the sample and estimating the specification of interest with PPML. Even more striking are the differences between the OLS and PPML coefficients on colony, a binary variable proposed in the Gravity dataset that takes the value one if a country pair has been in a colonial relationship. OLS estimation reports an insignificant coefficient that is very close to zero while columns (2) and (3) report significant PPML estimates of 0.34 and 0.60, respectively. More precisely, column (3) suggests that the predicted migration rates between two countries having a common colonial history is on average 80 percent higher than between countries that were never in a colonial relationship. Similarly, OLS estimation predicts migration rates

between countries sharing a legal system to be only slightly larger than between countries with different legal origins, while PPML coefficients predict migration rates to be 29 percent higher between the former. The opposite is observed for the common border coefficient. This dummy variable taking the value one when two countries share a border is estimated to have a positive effect on bilateral migration only when applying the OLS approach. Overall, the fact that the coefficients on distance, common language, colony, and legal origin increase while the coefficient on common border becomes insignificant in column (3) suggests that the observations dropped with the OLS approach are not only reporting rounding or measurement errors. Much more, this suggests that they represent true zeros, that is, that these observations report zero migration flows because migration costs exceed migration benefits.

Column (4) of Table 4.3 reports the results of estimating equation (4.11) with nest dummies instead of destination-year fixed effects. Recall that potential host countries are grouped in nests based on geographic and economic proximity, and that countries in the same nest are close substitutes for potential migrants. The results are very similar to the ones reported in column (3). The Poisson estimate in column (4) suggests that migration flows between countries sharing the majority religion are on average 101 percent higher than between countries having different religious backgrounds. This effect decreases with the size of diaspora as the coefficient on the interaction term is negative and highly significant. Moreover, column (4) reports that a 1 percent increase in the size of diaspora increases migration flows by 0.59 percent between countries with different religious backgrounds and by 0.51 between countries sharing the majority religion. The magnitude of the coefficients on distance, common language, colony, contiguity and common legal system are very similar to the ones reported in column (3).

Finally, column (5) of Table 4.3 presents the Poisson coefficients on the dyadic variables when the religious similarity of country pairs and its interaction with diaspora are dropped from the specification. These dyadic variables are traditionally included in

regressions used to analyse migration patterns in order to control for geographic and cultural distances between country pairs. However, even if these variables were shown to account for many types of migration costs, they might not adequately approximate cultural proximity. Sharing a common official language decreases migration costs by facilitating communication and increasing the probability of employment, but this does not necessarily imply cultural proximity between the source and host countries. Similar reasoning can be applied to the other dyadic variables. If they really capture cultural proximity, then their coefficients should decrease when including religious similarity in the specification. However, the coefficients on the dyadic variables reported in column (5) are not significantly different to the ones reported in column (3). This suggests that they do not adequately control for cultural factors that affect international migration flows.

To resume, the results presented in Table 4.3 predict that the religious similarity of country pairs has a positive effect on bilateral migration rates by promoting cultural proximity, providing newcomers with economic and social services, and providing immigrants with places where they can benefit from emotional and psychological support. Religious similarity seems to be especially important for immigrants moving to countries with small diaspora. Similarly, the positive effect of immigrant networks seems to be larger when migration takes place between countries with different religious backgrounds. These significant results suggest that religious similarity between country pairs should be included in specifications analysing migration patterns, especially because the traditional dyadic variables do not seem to adequately account for cultural factors.

Nonetheless, further analysis has to be performed before reaching general conclusions. Even if estimating the relationship of interest with PPML captures mis-specifications due to the high frequency of zero observations and to heteroscedasticity, there are still other challenges that need to be addressed before concluding that religious similarity has a causal effect on bilateral migration. This sensitivity analysis is performed in the next section.

4.7 Sensitivity Analysis

This section verifies the robustness of the main results by including negative migration flows in the analysis, accounting for endogeneity biases and verifying the efficiency of the PPML approach.

4.7.1 Negative Bilateral Migration Flows

International migration flows can take positive and negative values. Indeed, when approximating international migration flows with differences in migration stocks made available by the GBMD, 15 percent of observations report negative migration flows, 54 percent report zero flows and 31 percent report positive flows.⁴² Almost 50 percent of the negative migration flows are greater than -10, but there are also large flows, some of which are reported in Panel A of Table 4.4. They are mainly observed between big countries, such as India and Pakistan. Scaling the flows with the native population of the source country yields low migration rates. The opposite is observed in Panel B of Table 4.4, where it can be seen that the observations reporting high negative migration rates are associated with small island states, such as Palau, Brunei and Comoros.

Typically, observations reporting negative migration flows are excluded first because empirical approaches used in the migration setting, such as PPML, only allow non-negative dependent variables and second because there is only limited information about the source of these negative migration flows. They might represent return migration, but they can also be caused by measurement error, by migration to a third country or by death, which can all reduce the stock of immigrants but need to be treated differently when included in an analysis. If the stock of immigrants decreases because of measurement errors, migration to a third country or death, negative flows can be set to zero as they do not represent migration flows taking place between the source and destination

⁴²The GBMD migration stocks allow me to compute the flows for 136,107 observations.

Table 4.4: Negative Bilateral Migration Flows

Destination	Source	Year	Flows	Rate
Panel A: Largest Negative Migration Flows				
Pakistan	India	1960	-521,231	-0.01
Pakistan	India	1970	-5,077,778	-0.08
Pakistan	India	1990	-534,786	0.00
India	Pakistan	1960	-1,435,893	0.00
India	Pakistan	1970	-958,317	0.00
India	Pakistan	1980	-769,275	0.00
India	Pakistan	1990	-617,525	0.00
Pakistan	India	1980	-1,197,084	-0.01
Russia	Ukraine	1990	-1,598,682	-0.01
Ukraine	Russia	1990	-1,035,836	-0.02
Romania	Germany	1990	-820,763	-0.04
Poland	Germany	1980	-547,641	-0.02
Panel B: Largest Negative Migration Rates				
Palau	United States	1960	-2,886	-0.31
Brunei	India	1990	-40,813	-0.23
Macedonia	Austria	1980	-302,648	-0.17
Belize	United Kingdom	1970	-14,489	-0.13
Comoros	Madagascar	1970	-25,740	-0.11
Lesotho	South Africa	1990	-172,561	-0.10
Bermuda	United States	1960	-3,610	-0.10
Micronesia	Switzerland	1980	-7,161	-0.10
Turkmenistan	Russia	1960	-132,823	-0.10
Malta	United Kingdom	1990	-30,971	-0.09
Pakistan	India	1970	-5,077,778	-0.08
Sao Tome & P.	Angola	1970	-5,162	-0.08

Notes: Bilateral migration flows are computed by taking the difference between the GBMD migration stocks, that is, $M_{skt} = S_{skt+1} - S_{skt}$. Migration rates are computed by dividing the flows by the native population, M_{skt}/M_{sst} .

countries. However, they should be included in the analysis if they represent return migration. To do this, migration flows are first set to zero. Second, a proxy of international migration is constructed following Beine and Parsons (2012), where negative flows from country s to country k in period t are added to the inverse flows, that is, to the flows from

country k to country s in the same period.⁴³ Third, the rates of migration (M_{skt}/M_{sst}) are partitioned into ordered groups and the relationship of interest is estimated using an ordered logit approach. Besides allowing the inclusion of negative flows, this approach also has the advantage of controlling for potential biases due to outliers. Finally, if religious similarity between country pairs fosters positive migration flows by reducing assimilation and integration costs, then it should also decrease the likelihood that immigrants sharing the majority religion leave the host country. To support this assumption, negative flows are multiplied by -1 and regressed on the explanatory variables presented in equation (4.11). This regression is then estimated using a PPML approach.

Column (1) of Table 4.5 presents the results of setting the negative flows to zero. The Poisson coefficients are very similar to the ones observed in Table 4.3. They suggest that migration flows are 117 percent higher between countries sharing the majority religion and that this effect decreases with the size of diaspora. Column (2) presents the results of regressing the measure of bilateral migration suggested by Beine and Parsons (2012) on the explanatory variables. Religious similarity still has a significant and positive effect, but the magnitude of the Poisson estimate decreases. Moreover, the coefficient on the interaction term is not significantly different from zero anymore. However, the results presented in column (2) should be regarded with caution as the definition of this alternative response variable relies on the strong assumption that all negative flows can be added to the inverse positive flows without introducing any biases.

The results of estimating the relationship of interest with an ordered logit approach are presented in column (3). To do this, migration rates were partitioned into 12 groups of similar size, except for the largest group including all zero flow observations. Logit

⁴³The proxy of international migration flows proposed by Beine and Parsons (2012) takes the following form:

$$m'_{kst} = \begin{cases} m_{kst} & \text{if } m_{skt} \geq 0, \\ m_{kst} + m_{skt} & \text{if } m_{skt} < 0. \end{cases}$$

m_{skt} is set to zero if it is negative, and is unchanged if it is greater or equal to zero.

Table 4.5: Including negative bilateral migration flows

	(1) PPML	(2) PPML	(3) Logit	(4) PPML
Religious similarity (RS)	0.79*** (0.17)	0.42** (0.21)	0.19*** (0.02)	-0.22* (0.13)
RS*Diaspora	-6.00** (2.34)	-0.48 (3.04)	-0.06*** (0.01)	1.56 (1.57)
Diaspora	45.12*** (3.20)	48.74*** (3.08)	0.04*** (0.01)	97.16*** (1.45)
Distance (log)	-0.85*** (0.09)	-0.78*** (0.08)	-0.47*** (0.02)	0.06** (0.03)
Common language	0.47*** (0.11)	0.51*** (0.10)	0.33*** (0.03)	-0.10* (0.06)
Colony	0.89*** (0.15)	0.58*** (0.15)	0.82*** (0.16)	-0.05 (0.08)
Common legal origin	0.32*** (0.08)	0.24*** (0.09)	-0.02 (0.02)	-0.04 (0.05)
Common border	0.14 (0.15)	-0.24* (0.13)	0.46*** (0.17)	-0.27*** (0.06)
<i>Dependent variable</i>				
Positive migration flows	Yes	Yes	Yes	No
Zero migration flows	Yes	Yes	Yes	No
Negative migration flows	Zero	Added to	Yes	Yes
Observations	119,387	115,564	136,107	20,424
R-squared	0.80	0.79		0.99

Notes: This table presents the results of estimating the relationship between the religious similarity of country pairs and international migration flows using PPML and Logit. In each column, the observations reporting negative migration flows are included in the sample with different approaches. In column (1), they are set to zero. In column (2), they are added to the inverse positive flows. Column (3) reports the results of partitioning all observations in ordered groups and estimated the model using an ordered logit. Finally, column (4) multiplies the negative migration flow by -1 and regresses them on the explanatory variables. All columns include country-year dummies. The estimated robust standard errors reported in parentheses are clustered at source-nest pairs. Coefficients are statistically different from zero at the ***1%, **5% and *10% level.

estimates cannot be directly compared to PPML coefficients as they have a different interpretation. The logit coefficient on religious similarity suggests that the probability

of observing high migration flows between two countries sharing the majority religion is 1.2 times greater than between countries with different religious backgrounds, holding all other variables constant.⁴⁴ Again, the coefficient on the interaction term suggests that this difference decreases with the size of diaspora in the host country. This is consistent with the main results reported in section 4.6. However, in column (3), the coefficient on the dummy variable measuring common legal origin loses its significance while the estimate on contiguity is highly significant. This contradicts the results presented in Table 4.3, where I observe the opposite. There, the variable of common legal origin has a significant effect while sharing a common border does not seem to affect bilateral migration.

To shed some light on these contradicting results, negative bilateral migration flows are multiplied by -1 and the coefficients of interest are estimated using a PPML approach (column (4)). As expected, this estimation yields a negative coefficient on religious similarity, which suggests that negative migration flows are on average 24 percent lower between countries sharing the majority religion. In other words, immigrants are less likely to leave a country that shares the majority religion of their home country. Similarly, common language also seems to reduce outflows of immigrants as it facilitates assimilation and integration in the host country. Surprisingly, the results reported in column (4) predict that a 1 percent increase in the size of diaspora increases negative migration flows by 0.97 percent. A possible explanation is that a large diaspora attracts migrants who have strong relationships with their home country and only migrate because they find a familiar environment in the host country. This strong link with the country of origin might also increase the probability of return migration. Alternatively, as suggested by Beine et al. (2011), a larger diaspora might attract less qualified immigrants in particular. Such immigrants are more exposed to varying economic conditions, which

⁴⁴For an interpretation of the coefficients estimated using an ordered logit approach, see Long and Freese (2006) and Wooldridge (2010).

can lead to more fluctuation in the stock of immigrants. Finally, I observe in column (4) that negative flows increase with distance but decrease between two countries sharing a common national border. This contradicts the previous results and suggests that the theoretical model derived here to predict positive migration flows might not be adapted to predict negative migration flows. Further analysis is necessary to determine which factors affect negative migration flows. However, as this is not the main focus of this chapter and as precise data on return migration is not available, these questions are left for future research.

Overall, the results presented in Table 4.5 confirm the results found in section 4.6 as they also suggest that the religious similarity of country pairs increases bilateral migration flows and that this effect is especially important for migrants moving to countries with a small diaspora. Equivalently, they support the assumption that immigrant networks have a positive effect on international migration flows, which is especially important for flows taking place between countries with different religious backgrounds.

4.7.2 Endogeneity Bias

The results presented in Table 4.3 also have to be regarded with caution because religious similarity between country pairs might be correlated with the error term, which would lead to biased estimation.⁴⁵ It is unlikely that this bias is caused by simultaneous causality as religious similarity is approximated with a binary variable that is equal to one if two countries share the majority religion at the beginning of the period over which bilateral migration flows are observed. Moreover, even if international migration can affect the religious composition of a country, it is unlikely to change the majority religion.⁴⁶

⁴⁵The exogeneity of religious similarity is verified using a control function approach (see Wooldridge, 2010, p. 127) and an endogeneity test suggested by Baum, Schaffer and Stillman (2007) and implemented in Stata that is robust to arbitrary heteroscedasticity. Both tests reject the null hypothesis at conventional levels, which means that religious similarity is exogenous.

⁴⁶Of the 232 countries included in the WRD, only 39 changed their majority religion between 1970 and 2000 (Johnson and Grim, 2008). Among them, the majority religion of 36 countries changed from an “ethnic religion” to a Christian religion. It is very unlikely that the origin of this change lies in past

Alternatively, the endogeneity bias might be caused by unobserved omitted variables that simultaneously affect religious similarity and bilateral migration flows. Yet, the inclusion of pair-specific variables and of a full set of time-varying country dummies should address this type of mis-specification. Finally, endogeneity could be caused by measurement error as a dummy variable taking the value one when two countries share the majority religion might only imperfectly approximate religious similarity between country pairs.

To address this concern, the relationship of interest is estimated using two different instrumental variables (IV) approaches where religious similarity between country s and country k in year t (R_{skt}) is instrumented with an indicator of religious adherence in 1900. This indicator is an index that measures the probability that a randomly chosen individual in country k has the same religion as a randomly chosen individual in country s in 1900. It is obtained based on data from the WRD and is computed as follows:

$$A_{sk1900} = \sum_r a_{s1900}^r * a_{k1900}^r, \quad (4.14)$$

where A_{sk1900} is a Herfindahl index approximating religious similarity between countries s and k in 1900; r stands for the different religious denominations defined in the WRD and a_{s1900}^r and a_{k1900}^r are the fractions of individuals living in countries s and k , respectively, that adhere to religion r in 1900. Due to the strong persistence of religion over time, this instrument is correlated with religious similarity. However, it is very unlikely that religious adherences in 1900 affect flows of bilateral migration taking place between 1960 and 2000 other than through religious similarity today. If religious similarity is endogenous, then its interaction with the size of diaspora in the destination country also has to be instrumented. To do this, the index for religious adherence in 1900 is interacted with the proxy measuring the size of diaspora, and this term is employed as an instrument for $R_{skt} * N_{skt}$ (Wooldridge, 2010).⁴⁷

bilateral migration flows.

⁴⁷Note that according to Beine et al. (2011), the proxy measuring the size of diaspora is also correlated

Table 4.6: Estimating the migration equation with an IV approach

	(1)	(2)	(3)	(4)
Method	IV	OLS	OLS	OLS
Stage	2nd	1st	1st	Reduced
Dependent variable	Mig.	RS	RS*Dia	Mig.
Religious similarity (RS)	0.55*** (0.03)			
RS*Diaspora	-0.11*** (0.01)			
Religious adherence (RA) 1900		0.87*** (0.01)	-0.17*** (0.03)	0.50*** (0.03)
RA 1900*Diaspora		0.00 (0.00)	0.97*** (0.01)	-0.11*** (0.01)
Diaspora	0.78*** (0.01)	0.01*** (0.00)	0.10*** (0.01)	0.76*** (0.01)
Distance (log)	-0.35*** (0.01)	0.05*** (0.00)	0.16*** (0.02)	-0.34*** (0.01)
Common language	0.25*** (0.02)	0.09*** (0.01)	0.40*** (0.04)	0.25*** (0.02)
Colony	0.02 (0.06)	-0.01 (0.01)	0.22** (0.11)	0.01 (0.06)
Same legal origin	0.08*** (0.02)	-0.03*** (0.00)	-0.02 (0.02)	0.06*** (0.02)
Common border	0.18*** (0.06)	0.06*** (0.02)	0.20* -0.12	0.19*** (0.06)
Observations	42,184	42,184	42,184	42,184
R-squared		0.55	0.80	0.71

Notes: This table reports the results of estimating the determinants of (log) bilateral migration rates with an IV approach. Religious similarity is a dummy variable taking the value one when the source and destination countries share the majority religion. It is instrumented with a measure of religious adherence in 1900. Column (1) reports the second-stage results. Columns (2) and (3) report the first-stage estimates for religious similarity and its interaction with the size of diaspora, respectively. Column (4) presents the results of estimating the reduced-form equation of the dependent variable. All equations include country-year dummies. The estimated robust standard errors reported in parentheses are clustered at the country-nest pair. Coefficients are statistically different from zero at the ***1%, **5% and *10% level.

with the error term. In this case, the corresponding coefficients suffer from endogeneity bias and have to be interpreted with caution. I could follow Beine et al. (2011) and instrument the size of diaspora in order to address this problem. However, it is very difficult to identify models with multiple endogenous variables and their estimation might lead to results that are very difficult to interpret (Angrist and

In order to test the validity of the instruments, equation (4.12) is first estimated using a standard IV approach. The results of this estimation are reported in Table 4.6. Column (1) predicts that migration flows between two countries sharing the majority religion are about 73 percent higher than between countries having different majority religions, an effect that is 62 percent higher than the one predicted by the OLS estimates reported in Table 4.3. The negative coefficient on the interaction between religious similarity and the size of diaspora is only slightly higher than its OLS counterpart. It again suggests that religious similarity is especially important for potential migrants when the diaspora established in the host countries are small.

Table 4.7: Statistical validity of the instruments

	(1)	(2)	(3)
Method	IV	OLS	OLS
Stage	2nd	1st	1st
Dependent variable	Mig.	RS	RS*Dia
<i>Testing strength of identification</i>			
Kleibergen-Paap rk Wald statistic	5,684		
(p-value)	(0.00)		
Angrist-Pischke multivariate F-test of excluded instruments			
Statistic		9,715	7,870
(p-value)		(0.00)	(0.00)
<i>Testing under-identification</i>			
Kleibergen-Paap rk LM statistic	3,868		
(p-value)	(0.00)		
Angrist-Pischke first-stage chi-squared		10,046	8,138
(p-value)		(0.00)	(0.00)

Notes: See notes in Table 4.6 and the description of the tests in the text.

To verify the validity of the IV approach, the Kleibergen-Paap (KP) statistics are

Pischke, 2009). Therefore, and as the focus of this chapter is on religious similarity, I for now abstain from simultaneously instrumenting the proxy for religious similarity and the one measuring the size of diaspora. Ways of coping with this problem should be addressed in future work.

computed and presented in column (1) of Table 4.7. The KP rk LM statistic⁴⁸ suggests that both instruments are relevant and provide enough information in order to identify the model, and the KP rk Wald statistic⁴⁹ suggests that the correlation between the instruments and the endogenous regressors is sufficiently strong in order to avoid problems due to weak identification. These results are consistent with the first-stage estimates for religious similarity and for its interaction with diaspora which are reported in columns (2) and (3) of Table 4.6, respectively. The coefficients on the instruments are highly significant, and the Angrist-Pischke first-stage statistics presented in columns (2) and (3) of Table 4.7 also indicate that the individual endogenous regressors are identified and are sufficiently correlated with their instrument in order to avoid weak identification problems (Angrist and Pischke, 2009; Baum et al., 2007, 2002).⁵⁰

Finally, column (4) of Table 4.6 reports the results of estimating the reduced-form equation of the dependent variable, which verifies that the instruments are significantly different from zero when regressed on bilateral migration. Angrist and Pischke (2009, p. 213) point out that if the relationship of interest really exists, then it has to be observed in the reduced-form of the dependent variable. Estimating this reduced-form using OLS yields coefficients on the instruments that are highly significant and have the expected sign.

The results reported in Tables 4.6 and 4.7 thus confirm the main results and suggest

⁴⁸The Kleibergen-Paap rk LM statistic is the efficient first-stage statistic used to verify the relevance of the instruments when non-i.i.d. disturbances are assumed. Rejection of the null hypothesis suggests that the model is identified, that is, that the instruments are relevant.

⁴⁹In the presence of i.i.d. disturbances, weak identification problems are detected with the Cragg-Donald F-statistic, which is compared to the critical values published by Stock and Yogo (2005). However, in case of non-i.i.d. disturbances, the Kleibergen-Paap rk Wald statistic is the efficient statistic (Baum et al., 2007; Kleibergen and Paap, 2006; Kleibergen and Schaffer, 2007). Thus far, no critical values have been computed for this statistic. Therefore, in practice it is usually compared to the threshold number of 10 recommended by Staiger and Stock (1997); see also Stock et al. (2002). As a further robustness test, I compute the limited information maximum likelihood (LIML) estimates of regression (4.12) and find that the size of the LIML coefficients as well as their statistical significance are very similar to the IV estimates.

⁵⁰The KP statistics verify whether any of the endogenous variables are identified while the AP statistics are used in models with multiple endogenous variables as they verify whether a specific endogenous variable is identified and sufficiently correlated with its instrument.

that the instrumental variables are valid. However, this approach has two drawbacks. First, it is exactly identified and it can therefore not be verified whether the instruments satisfy the exclusion restriction. Yet, as mentioned previously, it is unlikely that a proxy of religious similarity measured in 1900 has an effect on bilateral migration flows taking place from 1970 to 2000, other than through religious similarity observed in those years. Second, the IV approach does not account for the biases found in the previous section, that is, biases caused by the high frequency of zero observations and the heteroscedasticity of the data. Only an IV version of the PPML estimation approach (henceforth IV PPML) can simultaneously account for these three types of distortions. Aware of this challenge, Santos Silva and Tenreyro recently developed such an estimator.⁵¹ However, when including a full set of time-varying destination and source country dummies in equation 4.11, the IV PPML approach does not converge. This computational difficulty is known by Santos Silva and Tenreyro (2011b, 2010), who explain that it can mainly happen for two reasons. The first is when the maximum likelihood estimator does not exist due to perfect collinearity between regressors or to dummy variables that always take the value one when the dependent variable is positive. The second is that convergence might not be achieved when the estimation approach encounters numerical problems that follow from large values in the dependent variable, from collinear regressors with very different magnitudes, or from regressors that are extremely but not perfectly collinear. The estimation including a full set of country-year dummies probably suffers from extremely collinear regressors, as these are the only regressors leading to non-convergence that cannot be identified and dropped. Therefore, in order to estimate the relationship of interest using IV PPML, I replace destination-year fixed effects by nest dummies and re-scale the problematic regressors. The results of this estimation are presented in Table 4.8.

Column (1) of Table 4.8 reports a positive coefficient on religious similarity that is

⁵¹The code is publicly available on their web page and is implemented in Stata 13. See the blog “The Log of Gravity Page” by Santos Silva and Tenreyro at <http://privatewww.essex.ac.uk/~jmcass/LGW.html>.

Table 4.8: Causal relationship between religious similarity and international migration

	(1)	(2)	(3)	(4)
Method	IV PPML	PPML	PPML	PPML
Stage	2nd	1st	1st	Reduced
Dependent variable	Mig.	RS	RS*Dia	Mig.
Religious similarity (RS)	1.42*** (0.28)			
RS*Diaspora	-0.11*** (0.04)			
Religious adherence 1900, (RA)		1.59*** (0.04)	2.46*** (0.07)	1.20*** (0.23)
RA*Diaspora		-0.28 (0.78)	-11.35*** (1.12)	-8.84*** (3.12)
Diaspora	0.62*** (0.04)	0.01 -0.01	0.42*** -0.01	0.58*** (0.04)
Distance (log)	-0.52*** (0.07)	0.08*** (0.01)	-0.07*** (0.01)	-0.50*** (0.08)
Common language	0.29* (0.15)	0.20*** (0.02)	0.20*** (0.03)	0.36*** (0.13)
Colony	0.57*** (0.20)	-0.06** (0.03)	-0.26*** (0.06)	0.52*** (0.20)
Common legal origin	0.27** (0.11)	-0.04*** (0.01)	0.04* (0.02)	0.25** (0.11)
Common border	-0.09 (0.20)	0.12*** (0.05)	-0.50*** (0.04)	-0.03 (0.18)
Constant	-8.82*** (0.82)	-1.51*** (0.16)	-6.08*** (0.26)	-8.37*** (0.87)
Observations	115,683	114,408	111,827	115,683
R-squared		0.58	0.68	0.57

Notes: This table reports the results of estimating the determinants of bilateral migration rates using an IV PPML approach. Religious similarity is a dummy variable taking the value one when the source and destination countries share the majority religion. It is instrumented with a measure of religious adherence in 1900. Column (1) reports the IV/second-stage results. Columns (2) and (3) report the first-stage estimates for religious similarity and its interaction with the size of diaspora, respectively. Column (4) reports the results of estimating the reduced-form equation of the dependent variable. All equations include time-varying source-country dummies and destination-nest dummies. The estimated robust standard errors reported in parentheses are clustered at the country-nest pair. Coefficients are statistically different from zero at the ***1%, **5% and *10% level.

significant at the 1 percent level, revealing a positive causal relationship between religious similarity and international migration. This IV Poisson coefficient is larger than

its PPML counterpart presented in Table 4.3, suggesting that endogeneity introduces a downward bias. The coefficient on the interaction term is also slightly higher than its PPML counterpart and still predicts that immigrants moving to countries with small diaspora benefit most from the fact that the host countries share the majority religion of the home countries. Apart from that, the coefficients on the control variables are very similar to the ones found in section 4.6. They suggest that a 1 percent increase in the size of diaspora increases bilateral migration rates on average by 0.62 percent. Moreover, bilateral migration rates decreases with distance and increase when two countries share the official language, a common colonial history, and when they have similar institutions. Columns (2) to (4) report significant coefficients on the instruments in the first stages and in the reduced-form, suggesting that they are relevant. Overall, the results presented here suggest that religious similarity of country pairs has a causal effect on international migration. This supports the hypothesis that religious similarity promotes cultural proximity and provides immigrants with networks, thereby fostering bilateral migration by facilitating integration and assimilation in the host country.

4.7.3 Efficiency of Alternative Estimators

In their studies, Santos Silva and Tenreyro explain that the PPML approach is to be preferred over other estimation methods because it yields consistent estimates even when the data is not Poisson-distributed. Indeed, the Pseudo Maximum Likelihood (PML) results published by Gourieroux, Monfort, and Trognon (1984) show that the estimates of PML approaches are consistent, as long as the conditional mean is correctly specified.⁵² However, this condition does not give any indication of the performance of an estimation approach. Its efficiency depends on second-moment information, that is, on the relationship between the conditional mean and the conditional variance of the dependent variable. To clarify this point, consider the following equation that generalises such

⁵²See also Manning and Mullahy (2001) and Santos Silva and Tenreyro (2006).

a relationship (Manning and Mullahy, 2001; Head and Mayer, 2013a):

$$v(y_i|x) = aE(y_i|x)^\lambda, \quad (4.15)$$

where $v(y_i|x)$ and $E(y_i|x)$ are the conditional variance and mean of the dependent variable, respectively.⁵³ When $\lambda = 0$, the conditional variance is equal to the constant a and does not depend on the explanatory variables. In other words, the disturbances are homoscedastic and the corresponding model can be estimated efficiently using OLS. PPML is the efficient approach when λ takes the value one, that is, when the conditional variance is proportional to the conditional mean, which itself depends on the regressors (x):

$$v(y_i|x) = aE(y_i|x),$$

where $a = \frac{v(y_i|x)}{E(y_i|x)}$. If λ differs from 1, PPML might still yield consistent estimates, but they are not necessarily efficient anymore. For instance, if $\lambda = 2$, that is, when the standard deviation is proportional to the mean, Manning and Mullahy (2001) provide evidence that the data follows a Gamma distribution.⁵⁴ However, when performing their Monte-Carlo simulations, they only address problems due to different types of heteroscedasticity and ignore biases caused by truncation and censoring. Santos Silva and Tenreyro try to fill this gap by evaluating the consistency and efficiency of different estimators when the dependent variable is measured with various types of errors. When these cause truncation, they find that the PPML approach generally outperforms all other estimators. This is because “models assuming that $V[y_i|x]$ is a function of higher powers of $E[y_i|x]$ might give excessive weight to the observations that are more prone to measurement errors” (Santos Silva and Tenreyro, 2006, p. 646). Therefore, they consider the PPML approach

⁵³The country and time subscripts are suppressed in order to simplify the notation.

⁵⁴To illustrate that the standard deviation is proportional to the mean in this case, set $\lambda = 2$ in equation (4.15) and take the square root to obtain $\sigma = \sqrt{a} E(y|x)$, where σ represents the standard deviation.

to be a “reasonable compromise” that should be applied even when the data does not follow a Poisson distribution.⁵⁵

In spite of the evidence provided by Santos Silva and Tenreyro (2006), Head and Mayer (2013a) warn against estimating a gravity-type equation using only PPML. Rather, they suggest that a thorough analysis should systematically compare OLS, PPML and GPML estimates. Moreover, they suggest estimating the parameter λ to further assess the adequacy of the chosen estimation approach. This can be done with the modified Park test presented in Manning and Mullahy (2001), where equation (4.15) is log-linearised and $v(y_i|x)$ and $E(y_i|x)$ are replaced by their sample counterparts $\hat{\sigma}^2$ and \hat{y}_i , respectively, to obtain:

$$\log \hat{\sigma}^2 = \log a + \lambda \log \hat{y}_i + u,$$

an equation that is estimated using OLS. Performing this test here yields an estimate of the parameter λ equal to 2.03, which suggests that GPML is the approach that should yield efficient coefficients. Unfortunately, GPML estimation does not converge when fixed effects are included in equation (4.11).⁵⁶ Therefore, if I want to perform the analysis suggested by Head and Mayer, I have to drop all fixed effects from the estimated specification. Doing this will yield biased coefficients but allows to compare the different estimation approaches. The results of this comparison are reported in Table 4.9, where columns (1), (2) and (3) present the coefficients estimated using OLS, PPML and GPML, respectively. This analysis is performed on the sub-sample including only observations that report positive migration flows as this allows me to keep the sample constant across columns.

⁵⁵In the trade setting, Santos Silva and Tenreyro (2006, 645-6) argue: “Trade data for larger countries (as gauged by GDP per capita) tend to be of higher quality (see Frankel and Wei, 1993; Frankel, 1997); hence, models assuming that $V[y_i|x]$ is a function of higher powers of $E[y_i|x]$ might give excessive weight to the observations that are more prone to measurement errors. Therefore, the Poisson regression emerges as a reasonable compromise, giving less weight to the observations with larger variance than the standard NLS estimator, without giving too much weight to observations more prone to contamination by measurement error and less informative about the curvature of $E[y_i|x]$.”

⁵⁶For an explanation of why a PML with fixed effects does not converge, see section 4.7.2.

Table 4.9: Comparing alternative estimators

	(1) OLS	(2) PPML	(3) GPML
Religious similarity (RS)	0.49*** (0.07)	0.64** (0.32)	0.99*** (0.23)
RS*Diaspora	-0.03 (0.02)	-0.01 (0.03)	-0.11*** (0.04)
Diaspora	0.54*** (0.01)	0.37*** (0.03)	0.44*** (0.04)
Distance (log)	-0.63*** (0.04)	-0.22*** (0.06)	-0.50*** (0.11)
Common official language	0.86*** (0.08)	1.12*** (0.15)	0.83*** (0.20)
Colony	0.39** (0.19)	0.53** (0.26)	1.98*** (0.28)
Same legal origin	0.02 (0.05)	0.09 (0.19)	0.77*** (0.24)
Common border	-0.05 (0.13)	-0.43** (0.20)	-0.01 (0.30)
Observations	42,184	42,184	42,184
R-squared	0.40	0.06	

Notes: Column (1) reports the results of estimating equation (4.12) using OLS. The dependent variable is the natural logarithm of the bilateral migration rates (Global Bilateral Migration Database) for the years 1960, 1970, 1980 and 1990. Columns (2) and (3), respectively, report PPML and GPML coefficients that result from estimating the relationship of interest in its multiplicative form. In these columns, the dependent variables are the bilateral migration rates. Only the sub-sample of positive migration flows is included in order to make the results comparable across columns. Religious similarity (World Religion Database) is a dummy variable that takes the value one when two countries have the same majority religion. The estimated robust standard errors reported in parentheses are clustered at source-nest pairs. Coefficients are statistically different from zero at the ***1%, **5% and *10% level.

The Gamma coefficient on the religious proximity of country pairs reported in column (3) of Table 4.9 is twice the size of its OLS counterpart and 50 percent larger than the PPML estimate. According to Head and Mayer (2013a, p. 44), if both the PPML and GPML coefficients are different from the OLS estimates, “then it is reasonable to conclude

that heteroscedasticity is a problem and the OLS estimates are unreliable.” This confirms previous findings that suggest that OLS estimates are biased due to heteroscedasticity. Moreover, the results suggest that the Poisson estimates represent the lower bounds of the true coefficients on religious similarity and its interaction with diaspora. However, as the estimation results presented in Table 4.9 do not include fixed effects, this suggestion should be considered with caution as the coefficients might be biased. Additionally, Santos Silva and Tenreyro emphasise that the GPML approaches give excessive weight to observations that are more likely to suffer from measurement errors, leading to estimates that are more biased and less precise than the Poisson coefficients. Nevertheless, the results presented in Table 4.9 justify the implementation of a PPML approach, a strategy that has recently been criticised in the literature (Egger and Staub, 2014).⁵⁷ In addition, this sensitivity analysis again confirms that the religious similarity of country pairs has a significant positive effect on international migration and that the significant coefficients of interest are not just an artefact of an inadequate estimation approach.

4.8 Concluding Remarks

This chapter first investigated whether religious similarity between source and destination countries affects international migration by promoting cultural proximity and providing newcomers with networks that offer them practical, emotional, and spiritual support. As ethnic-religious institutions embedded in diaspora also offer some of these services, this chapter also analysed whether and how this effect depends on the size of immigrant networks established in the host countries.

These questions were addressed using a utility maximisation model that assumes that potential migrants only move abroad if expected migration benefits exceed expected

⁵⁷See papers presented at the CESifo/ETH conference on Estimation of Gravity Models of Bilateral Trade, which took place in May 2014 in Munich. More information and related publications can be found at www.cesifo.org.

migration costs. In addition to the standard explanatory variables of bilateral migration, it includes a proxy for religious similarity of country pairs, a variable measuring the size of the diaspora established in the host country, and an interaction of these two variables. The equation derived from this model was estimated in its multiplicative form using a PPML approach. In order to account for multilateral resistance to migration, a full set of time-varying source- and destination-country dummies was included in the specification. Alternatively, destination countries were grouped in different nests and destination-year dummies were replaced by the corresponding nest dummies.

The Poisson estimates predict that, in the absence of a diaspora, immigration flows are on average 136 percent larger between countries sharing the majority religion than between countries with different religious backgrounds. This effect decreases with the size of immigrant networks established in the destination country and becomes insignificant when the diaspora achieves 6,000 members. Yet, less than 2 percent of observations included in the analysis report immigrant networks that reach this size. The empirical results therefore suggest that religious similarity between country pairs plays an important role in determining international migration flows in 98 percent of cases. Moreover, the coefficient on the interaction term between religious similarity and the size of immigrant networks established in destination countries suggests that diaspora are particularly important for potential migrants originating from countries that do not share the host countries' majority religion. These results are robust when including negative migration flows and applying an IV approach in order to control for potential biases in the coefficients of interest. Moreover, comparing OLS, PPML and GPML results suggests that the econometric approaches chosen to estimate the relationship of interest are adequate.

Future research shall attempt to dismantle the effect that religious similarity can have on male or female migration flows. It would also be interesting to discriminate between religions, regions or countries. Future research might also include indicators of religious independence and freedom provided by the Association of Religion Data Archives. This is

because the role of religious similarity in international migration might also depend on the intensity with which the religion is practised in the source and/or destination country. For instance, religious similarity might be particularly important when destination countries discriminate against individuals who do not adhere to the majority religion. On the other hand, it might be negligible when destination countries guarantee religious freedom.

Appendix to Chapter 4

Derivation leans heavily on Train (2009).

The density of a variable g with a Gumble distribution (iid extreme value) is

$$f(g) = e^{-g} e^{-e^{-g}}$$

and its cumulative distribution is

$$F(g) = e^{-e^{-g}}.$$

The difference between two iid extreme value variables g^* follows a logistic distribution:

$$F(g^*) = \frac{e^{g^*}}{1 + e^{g^*}}.$$

In our case, a migrant only moves to destination d if

$$V_{sd} + \epsilon_d^i > V_{sj} + \epsilon_j^i \quad \forall d \neq j,$$

where V is the observed utility and ϵ^i is the unobserved idiosyncratic utility that follows a Gumble distribution. Following McFadden (1974), the probability that migrant i born in country s chooses destination d is

$$\begin{aligned} P_{sd} &= P(V_{sd} + \epsilon_d^i > V_{sj} + \epsilon_j^i \quad \forall d \neq j) \\ &= P(\epsilon_j^i < \epsilon_d^i + V_{sd} - V_{sj} \quad \forall d \neq j). \end{aligned} \tag{4.16}$$

If ϵ_d^i was known, then $P_{sd}|\epsilon_d^i$ could be computed by multiplying the individual cumulative distributions. However, as ϵ_d^i is the unobserved part of the utility that individual

i gets from moving to country d , the choice probability can only be computed from

$$\begin{aligned}
P_{sd} &= \int_{\epsilon_d^i = -\infty}^{\infty} (P_{sd}|\epsilon_d^i) f(\epsilon_d^i) d\epsilon_d^i \\
&= \int_{\epsilon_d^i = -\infty}^{\infty} \left(\prod_{d \neq j} e^{-e^{-(\epsilon_d^i + V_{sd} - V_{sj})}} \right) e^{-\epsilon_d^i} e^{-e^{-\epsilon_d^i}} d\epsilon_d^i \\
&= \int_{g = -\infty}^{\infty} \left(\prod_{d \neq j} e^{-e^{-(g + V_{sd} - V_{sj})}} \right) e^{-g} e^{-e^{-g}} dg,
\end{aligned} \tag{4.17}$$

where, for notational convenience, I replaced ϵ_d^i by g in the last step. To further simplify the derivation, suppose that there are four alternatives where moving to destination d is alternative $d = 1$, and $k = 1, \dots, K$. I can then rewrite

$$\begin{aligned}
P_{s1} &= \int_{g = -\infty}^{\infty} \left(e^{-e^{-(g + V_{s1} - V_{s2})}} e^{-e^{-(g + V_{s1} - V_{s3})}} \dots e^{-e^{-(g + V_{s1} - V_{sK})}} \right) e^{-g} e^{-e^{-g} + \mathbf{Vs1} \cdot \mathbf{Vs1}} dg \\
&= \int_{g = -\infty}^{\infty} e^{-e^{-g} + \mathbf{Vs1} \cdot \mathbf{Vs1}} e^{-e^{-(g + V_{s1} - V_{s2})}} e^{-e^{-(g + V_{s1} - V_{s3})}} \dots e^{-e^{-(g + V_{s1} - V_{sK})}} e^{-g} dg \\
&= \int_{g = -\infty}^{\infty} \exp \left(- \sum_{k=1}^K e^{-(g + V_{s1} - V_{sk})} \right) e^{-g} dg \\
&= \int_{g = -\infty}^{\infty} \exp \left(-e^{-g} \sum_k e^{-(V_{s1} - V_{sk})} \right) e^{-g} dg.
\end{aligned} \tag{4.18}$$

To derive the logistic distribution, I further simplify by defining $a = \exp(-g)$ and hence $da = -\exp(-g)dg$.⁵⁸ When g goes to infinity, then a converges to zero. On the

⁵⁸Recall $\int_a^b f[u(x)]u'(x)dx = \int_{u(a)}^{u(b)} f(z)dz$.

other hand, when g goes to minus infinity, then a goes to infinity. I can hence rewrite

$$\begin{aligned}
 P_{sd} &= \int_{a=0}^{\infty} \exp \left(-a \sum_k e^{-(V_{sd}-V_{sk})} \right) (-da) \\
 &= \int_{\infty}^0 \exp \left(-a \sum_k e^{-(V_{sd}-V_{sk})} \right) da \\
 &= \frac{\exp \left(-a \sum_k e^{-(V_{sd}-V_{sk})} \right)}{-\sum_k e^{-(V_{sd}-V_{sk})}} \Bigg|_0^{\infty} \\
 &= \frac{1}{\sum_k e^{-(V_{sd}-V_{sk})}} \\
 &= \frac{e^{V_{sd}}}{\sum_k e^{V_{sk}}}.
 \end{aligned} \tag{4.19}$$

Chapter 5

Summary and Further Research

This thesis verified the robustness of the relationship between DtS trust and international trade flows already analysed by Guiso et al. (2009), provided first insights into the relationship between bilateral trust and (total, female, and male) international migration, and found a significant effect of religious similarity between country pairs on international migration. It included different strands of literature in sociology, psychology, and economics, developed international migration models using various distributional assumptions, described the strengths and weaknesses of different econometric approaches and opened many future avenues of research.

Chapter 2 highlighted the importance of performing a thorough sensitivity analysis. First, when reconsidering the relationship between bilateral trust across countries and international trade flows, it did not find robust evidence in favour of the hypothesis that culturally rooted differences in bilateral trust are important determinants of international trade, thereby contradicting the conclusions of GSZ.

Second, Chapter 2 provided first insights into the relationship between bilateral trust and international migration. It suggested that StD trust affects the way expectations about migration costs and benefits are formed, and that DtS trust could, for instance, influence immigration policies towards specific countries or regions. However, these hy-

potheses were not confirmed when estimating the migration regressions. Neither the coefficients on StD trust nor those on DtS trust were statistically significant when regressing total migration flows on them, in addition to traditional determinants of international migration.

Yet, while StD trust might be insignificant for total migration flows, it could play a role in female migration flows. This is because migration is a risky decision, and studies in experimental economics repeatedly show that women tend to be more risk-averse than men. Also, women are suspected to endure more stress than men when moving to a foreign country. This point was addressed in Chapter 3 where female and male migration flows were separately regressed on StD trust. These regressions were estimated using five different econometric approaches in order to account for biases potentially caused by endogeneity, heteroscedasticity in the data, and sample selection. Overall, the results did not provide evidence that StD trust is particularly important for potential female migrants. Neither did the estimations yield significant trust coefficients when focusing on male migration flows.

It is important to recall that Chapters 2 and 3 focused exclusively on bilateral trade and migration flows within Europe, where countries share many cultural traits and have similar historical and institutional backgrounds. I do not claim that the results found in these chapters provide evidence in favour of the hypothesis that bilateral trust is insignificant for international trade and migration in general. They only suggest that bilateral trust does not matter for international trade and migration flows taking place within Europe. Ideally, this analysis should be extended to flows taking place between more diverse countries. Unfortunately, data on bilateral trust necessary for such an analysis does not yet exist. This broader analysis therefore has to be left for future research.

Moreover, it is possible that the measures of average trust that citizens from one country place in those from another country, as elicited from the employed Eurobarometer

surveys, are not appropriate measures of bilateral trust in the context of international trade and migration. I therefore do not go as far as to challenge the view of Arrow (1972, p. 357), who pointed out that “Virtually every commercial transaction has within itself an element of trust, certainly any transaction conducted over a period of time. It can be plausibly argued that much of the economic backwardness in the world can be explained by the lack of mutual confidence.” Further, it would be very interesting in future research to estimate similar relationships with alternative measures of bilateral trust to the one provided by the Eurobarometer surveys.

Chapter 4 also opens many research questions. Estimating a migration model with observations from approximately 230 countries over the years 1960, 1970, 1980, and 1990, I found that religious similarity between source and destination countries significantly affects international migration. Religious similarity is suspected to decrease assimilation and immigration costs by promoting cultural proximity and providing newcomers with networks that offer them practical services and emotional, spiritual and psychological support. As some of these services and supports are also provided by immigrant networks established in destination countries, the migration-promoting effect of religious similarity might depend on the size of the diaspora. Performing a thorough analysis, the results provide evidence that migration flows are significantly larger between countries sharing the majority religion. Moreover, they suggest that this effect indeed depends negatively on the size of diaspora. In other words, the results predict that migrants with different religious backgrounds are more likely to migrate to destination countries that provide them with large immigration networks.

These results open many future avenues of research. For instance, additional work could dismantle the effect that religious similarity has on male or female migration flows. It would also be interesting to discriminate between religions, regions, or countries. Future research might include indicators of religious independence and freedom provided by the Association of Religion Data Archives. Alternatively, the GBMD could be replaced by the

Global Religion and Migration Database proposed by the Pew Research Centre's Forum on Religion and Public Life, which classifies bilateral migration flows for the year 2012 by religious denomination. The results in Chapter 4 could also be of some interest to policymakers. For instance, potential losses in the competitiveness of European countries are expected due to critical shortages of nurses and engineers. Such shortages might be mitigated by international migration, but to attract individuals who could fill these open positions, policymakers need to be aware of the factors affecting the decisions of potential migrants to move abroad. In addition to traditional factors such as income and moving costs, Chapter 4 suggests that religious similarity might affect these location choices. Of course, it is hard to change a country's religious background without incurring enormous costs. Think, for instance, of the recent events taking place in Iraq, where groups like the Islamic State and the Nusra Front persecute all individuals adhering to different beliefs than theirs. Fortunately, the results in Chapter 4 also suggest that policy makers could attract workers from countries with different religious backgrounds by promoting immigrant networks. Obviously, such decisions need to be preceded by thorough analyse of the dynamics of these networks within destination countries in order to avoid segregation and potential social unrest.

More generally, this thesis addresses interesting questions that are part of the branch of literature analysing the cultural determinants of economic outcomes. This literature increases in importance in the light of recent events, such as the financial crises, the revolutions in the Middle East, the appearance of Islamic fundamentalism in some regions of the world and the conflict in Ukraine. Such events are often accompanied by migration flows that increase the cultural diversity in host countries. In order to benefit from this diversity, future research should increasingly take cultural factors into account. There is a lot of work for researchers interested in culture and its consequences on economic behaviour. They might benefit from the inclusion of sociological and psychological studies that often provide interesting insights into human decisions. This is a promising avenue

of research that can contribute to the improvement of economic and social conditions in many countries.

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