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Remittances, Migrants' Education and Immigration Policy: Theory and Evidence from Bilateral Data^{*}

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Abstract

We investigate the relationship between remittances and migrants' education both theoretically and empirically, using original bilateral remittance data. At a theoretical level we lay out a simple model of remittances interacting migrants' human capital with two dimensions of immigration policy: restrictiveness, and selectivity. The model predicts that the relationship between remittances and migrants' education will be inversed-U shaped, with the increasing segment being longer (resp. shorter) for more restrictive (resp. selective) immigration policies. These predictions are then tested empirically using bilateral remittance and migration data and proxy measures for the restrictiveness and selectivity of immigration policies at destination. The results strongly support the theoretical analysis, suggesting that immigration policies determine the sign and magnitude of the relationship between remittances and migrants' education.

Keywords: Remittances, Migration, Brain Drain, Immigration Policy.

JEL codes: F24, F22, O15, J61

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1 Introduction

This paper investigates the relationship between remittances and migrants' education both theoretically and empirically, using original bilateral remittances data. This question is important because the increasingly quality-selective nature of immigration policies in many traditional destinations (favoring immigration of highly educated workers and at the same time discouraging immigration of low-skill workers) has raised concerns in developing countries and among international development agencies that such policy changes will result in more brain drain and less remittances. These concerns are based on the tacit view that the highly educated remit less. And indeed, there are many reasons to expect a negative relationship between remittances and migrants' education: more educated migrants often come from richer families and have a higher propensity to migrate with their entire household (hence, less need to send remittances) and a lower propensity to return, reducing the incentives to remit as a way of maintaining prestige and ties to the home community. On the other hand there are also many reasons for expecting a positive relationship: better educated migrants have a higher income potential, are less likely to be illegal and more likely to have bank accounts and access to less costly transfer means. In addition, their education may have been funded by implicit loans from family members to be repaid with interest in the form of remittances.¹ A priori then, it is not clear theoretically whether the highly skilled will remit more or less on average. Empirically, the question has been surprisingly understudied.

At a macro level, the only empirical evidence to look at this issue using aggregate data are two recent papers by Faini (2007) and Niimi, Ozden and Schiff (2010). Faini (2007) shows that migrants' remittances decrease with the proportion of skilled individuals among emigrants and concludes: "this result suggests that the negative impact of the brain drain cannot be counterbalanced by higher remittances". Faini's result is confirmed by Niimi, Ozden and Schiff (2010) after instrumenting the number of emigrants (but treating the proportion of skilled as exogenous). Such analysis, however, can tell us whether countries which send more (or a larger share of) highly skilled emigrants receive less or more remittances than countries that send relatively less skilled emigrants. However, there are many other ways that countries differ, and so any correlation between remittances and the skill level observed across countries may be spurious.² Moreover, these studies suffer from the fact that they use migration data for emigrants to the OECD area only while the remittances data are for remittances sent from anywhere in the world, not just the OECD, which creates important potential sources of bias. The macro literature also includes one bilateral

¹See Rapoport and Docquier (2006) for a comprehensive survey of the literature on migrants' remittances. See also Ashraf et al. (2010) for experimental evidence on financial education and remittances.

²For example, if poverty is a constraint to both migration and education, we may find richer developing countries being able to send more migrants (yielding more remittances), and that these migrants also have more schooling.

study by Schioupou and Siegfried (2006) who used a bilateral remittances database recently released by the European Central Bank and found instead a negative correlation between the share of low-skill workers and remittance receipts, suggesting that in contrast to the results obtained with aggregate data, migrants' skills seem to raise remittances.³

At a micro level, Bollard et al. (2011) examine the relationship between remittances and migrants' education using household survey data on immigrants in eleven destination countries. They find a mixed pattern between higher education and the likelihood of remitting, and a strong positive relationship between higher education and the amount remitted conditional on remitting. Combining these intensive and extensive margins gives an overall positive effect of higher education on the amount remitted, with an expected amount of \$1,000 annually for a migrant with a university degree against \$750 for someone without university degree. In relative terms however, and for the surveys containing information on income, the less educated tend to remit a larger share of their income. Bollard et al. (2011) also investigate why the more educated remit more and find the higher income earned by migrants, rather than characteristics of their family situations or their return intentions, explains much of the higher remittances. It is noteworthy that these results are obtained for the pooled data and hold for most but not all surveys; for example, they are not supported in the case of immigrants surveyed as part of the German Socio-Economic Panel, for which there is a negative (but not significant) association between remittances and holding a university degree. And indeed, using different waves of the German Socio-Economic Panel, Dustmann and Mestres (2010) find a negative effect of education on remittances after controlling for intentions to return and household composition at destination. Duval and Wolff (2011) also use longitudinal survey data on remittances to Albania and find remittances decrease with both the migrants and recipients' level of education.

This paper makes three contributions in terms of data, theory, and empirics. The first contribution is to build in Section 3 a new bilateral remittances database by merging various second-hand sources to capture bilateral remittances from 89 sending to 46 receiving countries over the period 1985-2005. To the best of our knowledge, the resulting database is the most comprehensive bilateral remittance data set currently available. Second, we lay out in Section 2 a simple model of remittance behavior interacting migrants' human capital with two dimensions of immigration policies: restrictiveness, and selectivity. Our model predicts that the relationship between remittances and migrants' education will be inversed-U shaped, with the increasing segment being longer (resp. shorter) for more restrictive (resp. selective) immigration policies. The main testable implication, therefore, is that for a given country pair, a more skilled pool of migrants will send more (resp. less) remittances if the desti-

³Other recent studies of the determinants of remittances using bilateral data include Lueth and Ruiz-Arranz (2008), de Sousa and Duval (2010), and Frankel (2011). However these studies do not look at the effect of the skill composition of bilateral migration flows.

nation country has a more restrictive (resp. selective) immigration policy. Finally, these predictions are tested in Section 4 using bilateral remittance data and proxy measures for the restrictiveness and selectivity of immigration policies at destination.

2 Theory

In this section, we study the macroeconomic relationship between remittances and the skill composition of migration. We show that this relationship need not be monotonic and depends on the type and intensity of immigration policies in the destination countries. We consider a model with a single skill type and formalize the remittance behavior of a migrant endowed with $h \geq 1$ units of human capital. The assumption that $h \geq 1$ is reasonably always satisfied if h measures, for example, the number of years of schooling or the number of efficiency units of labor. The skill price in the destination country is denoted by w^* whereas the skill price at origin is denoted by $w < w^*$. Each migrant has the possibility to remit an amount T to her origin country. We assume that each potential education group is described by a representative agent who decides whether and how much to remit.

The model can be interpreted as a dynamic model in which migrants live for two periods: they migrate in the first period and decide which fraction of time θ to spend abroad in the second period. The amount remitted T is then equivalent to accumulating savings (at unitary return rate) in order to prepare one's return to the home country. Alternatively, the model can also be interpreted as a static model in which migrants care about their own utility and the utility of other family members, a fraction θ of which can be brought with the migrant as dependents. For simplicity, in the static case, we normalize family size (excluding the migrant) to unity and assume that transfers are such that all family members' incomes (including the migrant and those who stay in the home country) are equalized. More sophisticated assumptions could be factored in but are unlikely to affect the nature of the results.

Immigration policies at destination are assumed to be fully characterized by two parameters. A first scale parameter, denoted by c , captures the general restrictiveness of the immigration policy: the higher c , the higher the cost of increasing the fraction of time θ (e.g., through obtaining a permanent visa) during which the migrant is able to stay at destination during the second period; or, in the static model, the higher the cost of bringing additional family members through family reunion programs. A second parameter, denoted by a , captures the selectivity of the immigration policy: the higher a , the larger the cost advantage for an educated migrant to extend her stay during the second period or bring additional family members. Formally, for a migrant of type h , the utility cost of staying a proportion θ of the second period (in the dynamic model) or to attract θ percent of the family (in the static one) may be written as:

$$C(\theta; h) = \frac{c\theta}{h^a} \quad (1)$$

The migrant's utility is assumed to be logarithmic in income and must account for the cost of an extended stay or of bringing additional family members. It can be written as follows:

$$U(T, \theta; h) = \ln[w^*h - T] + \ln[\theta w^*h + (1 - \theta)wh + T] - \frac{c\theta}{h^a} \quad (2)$$

Maximizing (2) with respect to T gives

$$T^*(\theta; h) = \frac{(1 - \theta)(w^* - w)h}{2} \quad (3)$$

Clearly, there will be no remittances if $\theta = 1$, that is, if migration is permanent (in the dynamic interpretation of the model) or if the migrant brings with her all the members of the family (in the static model). For any given $\theta < 1$, the amount remitted is always positive given that $w^* > w$ and is proportional to the migrant's skill level h . Micro-level empirical studies, therefore, should find a positive effect of migrants' skills on remittances after controlling for the location of family members and the expected duration of stay at destination (see Bollard et al., 2011). Such control variables, however, are not available at the macro level. Besides, the unobserved propensity to extend one's stay or to bring family members might be endogenous and vary with the migrants' human capital.

Substituting T^* into the utility function (2) gives the following quasi-indirect utility function

$$V(\theta; h) = 2 \ln \left[\frac{(1 + \theta)w^*h + (1 - \theta)wh}{2} \right] - \frac{c\theta}{h^a}$$

Maximizing $V(\theta; h)$ with respect to θ gives

$$\theta^*(h) = \begin{cases} 0 & \text{if } h \leq h_0 \\ \frac{2(w^* - w)h^a - c(w^* + w)}{c(w^* - w)} & \text{if } h \in [h_0, h_1] \\ 1 & \text{if } h \geq h_1 \end{cases} \quad (4)$$

The interior solution is obtained by setting $V' = 0$. Since $V'' < 0$, it is a maximum. A corner solution is obtained when $h \notin [h_0, h_1]$. The critical levels of human capital $h_0 \equiv \left[\frac{c(w^* + w)}{2(w^* - w)} \right]^{1/a}$ and $h_1 \equiv \left[\frac{cw^*}{w^* - w} \right]^{1/a}$ are such that $h_1 > h_0$; they are increasing with the restrictiveness of the immigration policy (c) and decreasing with the intensity of skill-selective programs (a). If human capital is very low ($h \leq h_0$), migrants will choose to move alone and will be unable to extend their stay beyond the first period ($\theta^* = 0$). This situation is likely to be observed in destination countries conducting guest worker programs (e.g., in the member countries of the Gulf Cooperation Council) where c is

very high. If human capital is very high ($h \geq h_1$), migrants will choose to bring all their family members with them or move permanently ($\theta^* = 1$).

Focusing on the interior solution, the time spent abroad, or the number of sponsored relatives (i.e., $\theta^*(h)$), increases with the migrant's human capital when the destination country conducts a selective policy ($a > 0$) and decrease with the general restrictiveness of the immigration policy (c). Note that $\theta^*(h)$ is an increasing and concave function of h if skill-selection is weak ($a < 1$) and an increasing and convex function of h if skill-selection is strong ($a > 1$). In both cases, highly skilled migrants are richer but migrate for longer periods or with more family members. The amount remitted becomes an ambiguous function of migrant's education. Substituting $\theta^*(h)$ from (4) into (3) gives the reduced-form expression for the optimal amount of remittances:

$$T^*(h) = \begin{cases} T_0(h) \equiv (w^* - w)\frac{h}{2} & \text{if } h \leq h_0 \\ T(h) \equiv [cw^* - (w^* - w)h^a]\frac{h}{c} & \text{if } h \in [h_0, h_1] \\ T_1(h) \equiv 0 & \text{if } h \geq h_1 \end{cases} \quad (5)$$

The function $T_0(h)$ is linear and increasing in h . The function $T(h)$ is concave in h , such that $T(0) = T(h_1) = 0$. It reaches a maximum at h_m defined as

$$h_m = \left[\frac{cw^*}{(1+a)(w^* - w)} \right]^{1/a} \quad (6)$$

which is higher than h_0 if and only if $a < \frac{w^* - w}{w^* + w} \equiv \hat{a} \in [0, 1]$.

Figure 1 describes the relationship between migrants' skills (h) and the optimal amount of remittances (T^*). We only depict the situation where the interior maximum h_m is larger than h_0 .⁴ We see that the optimal amount of remittances T^* is first proportional to the migrant's education level (for $h < h_0$), is then increasing and concave for intermediate levels of education (between h_0 and h_m) and finally decreases with education for higher levels of education (between h_m and h_1). An increase in the restrictiveness of the immigration policy (a higher c) shifts the transfer curve outwards, as depicted by the grey dashed line: all the critical values h_0 , h_1 and h_m are increased (this is why they are expressed as functions of c and a). In contrast, an increase in the selectivity of the immigration policy (a higher a) shifts the transfer curve inwards, unambiguously reducing h_0 , h_1 and h_m and making the segment $[0, h_0]$ shorter. Using (6), the effect on h_m is given by

$$\frac{\partial h_m}{\partial a} = \frac{-h_m^{1+a} \ln h_m}{(1+a)a} < 0$$

⁴The other case where the maximum h_m is lower than h_0 is very similar to Figure 1, except that the linear segment of the transfer curve, $T_0(h)$, intersects with the concave part, $T(h)$, at the right of its maximum attained with $h = h_m$. Remittances increase linearly with education when $h < h_0$ and decrease for higher levels of education. Again, an inverted-U shaped function is obtained.

This expression is clearly negative given that h and therefore h_m are greater than 1.

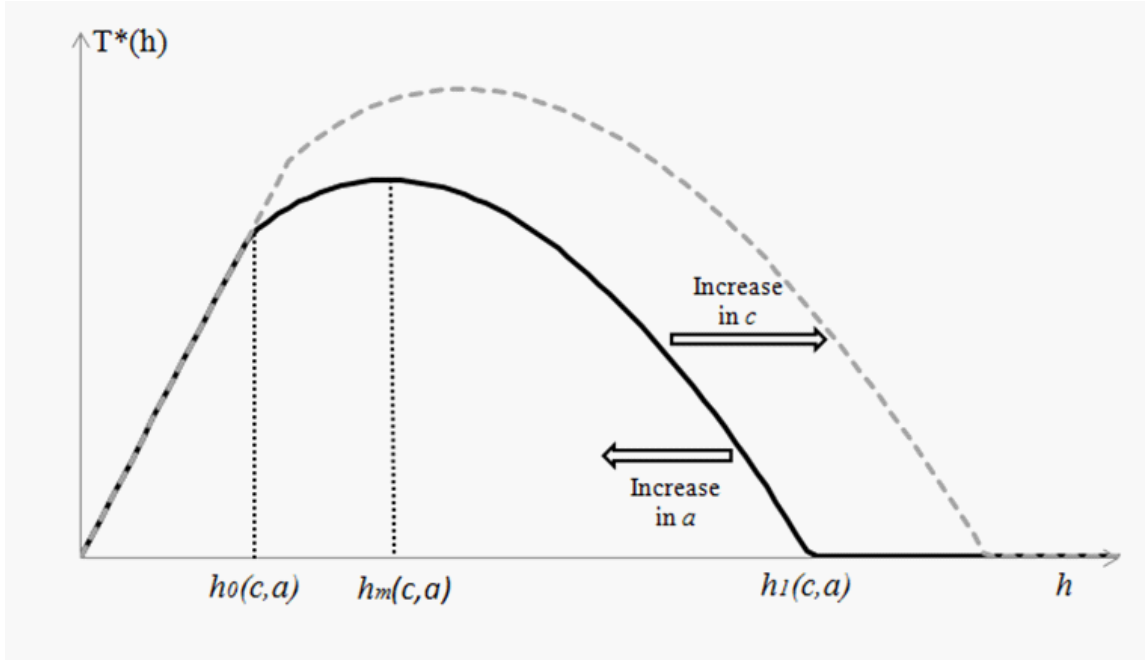


Figure 1: Remittances and migrants' education level

Note that the initial decision to migrate implies comparing the optimal utility of migration, $V(\theta^*(h); h) - \epsilon$ where ϵ is a random iid term capturing heterogeneous emigration costs, with the utility of staying at home, $2 \ln(wh)$. This comparison is made ex-ante and explains the pattern of self-selection into migration. In the empirical analysis, we will consider the bilateral composition of migration as exogenous.

The testable implications of our model, therefore, are the following:

- The relationship between remittances and migrants' education can be non-monotonic, depending on the range of the observed skill levels $[h_{\min}, h_{\max}]$. If the maximum of the transfer curve, h_m , is such that $h_{\max} < h_m$, then an increasing relationship between remittances and migrants' education is obtained. If $h_m < h_{\min}$, then a decreasing relationship is obtained. And if $h_{\min} < h_m < h_{\max}$, then the relationship between remittances and migrants' education is inverse-U shaped.
- The shape of the transfer curve depends on the restrictiveness and selectivity of immigration policies at destination. Hence, the relationship between remittances and education is likely to vary with the characteristics of destination countries. More precisely:
 - The higher the restrictiveness of the immigration policy at destination (c), the larger the segment on which remittances increase with education. In

more restrictive destination countries, remittances are more likely to be positively correlated with the migrants' education level.

- The higher the selectivity of the immigration policy at destination (a), the smaller the segment on which remittances increase with education. In more selective countries, remittances are more likely to be negatively correlated with the migrants' education level.

To test these predictions we need bilateral data on remittances, the size and structure of migration, and proxy measures for the restrictiveness and selectivity of immigration policies.

3 Data

To examine the relationship between remittances and the skill level of migrants, we construct a new comprehensive bilateral data set documenting the amount of remittances sent by transferring country j to recipient country i at time t (denoted by R_{ijt}), and the size and structure of bilateral migration stocks from origin country i to destination country j . We denote by M_{ijt}^h the stock of migrants with education level h .

3.1 Bilateral migration data

Migration data are taken from Docquier et al. (2010) who construct 195x195 matrices of bilateral migration stocks for 1990 and 2000. The matrices are computed for two skill groups: migrants with college (tertiary) education, referred to as high-skill, and with less than college education (primary and secondary), referred to as low-skill. The methodology used in Docquier et al. (2010) consists of three steps. The starting point is the database described in Docquier, Lowell and Marfouk (2009) documenting bilateral migration stock to OECD host countries. It is based on a collection of census and register immigration data by country of birth and educational level in the 30 OECD countries. The second step consists of a collection of similar immigration data from 46 non-OECD destinations in 2000 and 31 destinations in 1990. Finally, data collected in steps 1 and 2 are used to predict the size and structure of migration to the remaining 119 non-OECD host countries in 2000 (and 134 in 1990). Gravity regression models were estimated for the size of bilateral migration from country i to country j in the education group h . The latter constructed data will not be used in our empirical analysis, which only builds on primary census data.

3.2 Bilateral remittances

3.2.1 Primary sources

The main difficulty is to obtain a large database on bilateral remittances. Our data set combines five existing databases constructed by other authors or organizations:

- The **EU database** (labeled as database I) is documented in a report of Jimenez-Martin, Jorgensen and Labeaga (2007) for the European Commission. It provides yearly bilateral remittances data from 16 EU origin countries⁵ to 33 destinations⁶ from 2000 to 2005. The database is unbalanced and includes a total of 337 observations covering 89 pairs of countries. To construct this database the authors relied mainly on the National Balance Sheet of Payment Statistics, the Second EU Survey on worker's remittances from the EU to third countries, surveys based on micro-level data, and data from various less important sources.
- The **IMF database** (labeled as database II) is documented in the paper by Lueth and Ruiz-Arranz (2008), two researchers from the International Monetary Fund. It distinguishes 69 remittances sending countries⁷ and 11 recipient countries from Asia and Europe (Bangladesh, Croatia, Indonesia, Kazakhstan, Macedonia, Moldova, Philippines, Serbia and Montenegro, Slovenia, Tajikistan, Thailand)⁸ that break down their remittance receipts by country of origin and spans the period 1980-2005. The panel is unbalanced and includes a total of 1650 observations covering 200 country pairs. Remittance data (in USD) was provided by the recipient countries which produce estimates of inward remittances by paying countries using a variety of sources, including the International Transaction Recording System (ITRS), migrant surveys and statistics, as well as statements and surveys from banks and money operators. The bilateral

⁵Belgium, Cyprus, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Netherlands, Poland, Portugal, Slovenia, Spain, United Kingdom

⁶Albania, Algeria, Argentina, Armenia, Bangladesh, Belarus, Bolivia, Brazil, Bulgaria, China, Colombia, Dominican Republic, Ecuador, Egypt, Georgia, Ghana, Israel, Jordan, Lebanon, Libya, Moldova, Morocco, Nigeria, Pakistan, Peru, Romania, Suriname, Syria, Tunisia, Ukraine, United States, Venezuela

⁷Armenia, Australia, Austria, Azerbaijan, Bahrain, Belarus, Belgium, Bosnia, Brunei, Canada, China, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hong Kong, Hungary, Indonesia, Iraq, Ireland, Israel, Italy, Japan, Jordan, Kazakhstan, Korea, Kuwait, Kyrgyzstan, Latvia, Liberia, Lithuania, Luxembourg, Lybia, Macedonia, Malaysia, Malta, Moldova, Netherlands, New Zealand, Norway, Oman, Poland, Portugal, Qatar, Romania, Russia, Saudi Arabia, Serbia and Montenegro, Singapore, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Taiwan Province of China, Tajikistan, Turkey, Turkmenistan, Ukraine, United Arab Emirates, United Kingdom, United States, Uzbekistan

⁸Latin American countries have been excluded on purpose by the authors since most of their remittances originate in the United States, and this corridor has been widely studied by the Inter American Development Bank. See database IV below.

flows captured in this data set account for nearly 90 percent of all remittances recorded in the balance of payments of these countries.

- The **Romanian database** (labeled as database III) is documented in the paper by De Sousa and Duval (2010). It provides bilateral remittances data (in USD) from 17 countries (12 EU countries plus Canada, the United States, Israel, Turkey and Switzerland) to Romania and covers the period 2005-08. Four observations per year are provided by the authors. The panel is balanced. The main source is the National Bank of Romania where data by paying country have been collected.
- The **IDB database** (labeled as database IV) was built by the International Development Bank. It provides bilateral remittances data from the United States to 5 Latin American countries (Costa Rica, Dominican Republic, El Salvador, Guatemala and Panama) and covers the period 2003-04. The panel is balanced. The main source is the US balance of payment.
- The **ECB database** (labeled as database V) is documented in the paper by Schioupou and Siegfried (2006), two researchers from the European Central Bank. It provides bilateral remittances data from 21 European paying countries (19 EU countries, plus Norway and Switzerland) and other non EU countries⁹ to 9 recipient countries (Algeria, Egypt, Morocco, Tunisia, Croatia, Macedonia, Serbia and Montenegro, Romania, Russia)¹⁰ and covers the period 2000-05. The panel is unbalanced.

Since each original database (except the IDB one) is unbalanced with respect to either the year of reference or the list of origins/destinations, we extended them over time and/or space in order to make them as balanced as possible and compatible with each other. The procedure consists in three steps:

3.2.2 Creation of missing triplets and censoring

We refer to a data point containing information on remittances from a given origin to a given source at a given year as a "triplet". Four out of five of the remittances databases to be merged are unbalanced with respect to at least one of these three dimensions. We create the missing triplets starting first by constructing the missing origin/destination country pairs and then by plugging the corresponding reference

⁹Algeria, Australia, Bahrain, Cameroon, Canada, Chad, China, Congo, Cyprus, Cote d'Ivoire, Egypt, Estonia, Ethiopia, Gabon, Guinea, Iraq, Israel, Japan, Jordan, Kuwait, Latvia, Lebanon, Libya, Lithuania, Mali, Malta, Mauritania, Morocco, Niger, Oman, Qatar, Russia, Rwanda, Saudi Arabia, Senegal, Slovenia, South Korea, Syria, Togo, Turkey, Ukraine, United Arab Emirates, United States, Yemen

¹⁰For these countries the data come from their national central banks, except for Morocco where they come from the Office des Changes.

years. Once the missing triplets have been created in each original remittances data set, their remittances value has been censored to zero.¹¹ Our guiding assumptions here is that the authors of the original data sets did not report data points that were below a certain critical value (unknown to us). In other terms we assumed that the amount of money transferred was negligible, that is, almost equal to zero for the missing pairs of countries. There are two situations in which missing values have not been censored. First, for missing values belonging to a triplet already present in another data set for which a positive value of remittances is available, and second when the missing value of remittances belongs to a triplet which is situated between two time-specific triplets for which positive values of remittances are available. In the first case, the same amount of remittances has been transferred over the same triplet from one data set to another. While in the second case, the mean of the two positive observed values belonging to the previous and the following triplet has been estimated to replace the missing one.¹²

As far as the EU database is concerned, missing couples have been created expanding the list of remittances receiving countries up to the full sample of 44 countries obtained after the aggregation of the 5 databases. The new couples created refer to the same period of time belonging to the balance of payment or to the surveys used by the paying country.¹³

For the IMF data set, missing couples have been generated expanding the list of paying countries up to the full sample of 89 countries obtained after the aggregation of the 5 databases. The new couples created refer to the same length of time of the balance of payment used by the receiving country.¹⁴ For the Romanian database, missing observations for the year 2005 have been created by expanding the list of paying countries up to the full sample of 89 countries obtained after the aggregation of the 5 databases. For the IDB data set we did not add any empty cells since the data set is balanced from the beginning. Finally, for the ECB data set, missing couples have been created expanding the list of paying countries up to the full sample of 89 countries obtained after the aggregation of the 5 databases and refer to the same

¹¹The EU database has the highest percentage (89%) of created zeroes, followed by IMF (66%), Romania (62%) and ECB (61%).

¹²We only interpolated four cells in the EU database. For each of the following triplets, Brazil Spain 2002, Ecuador Spain 2002, Peru Spain 2002 and United States Spain 2002, we did not censored the missing remittances value to zero but we computed the mean value between the observed remittances in year 2001 and 2003.

¹³Belgium from 2002-2004, Cyprus from 2002-2005, France from 2002-2005, Germany from 2000-2005, Greece from 2000-2005, Hungary from 2000-2005, Ireland 2002-2005, Italy 2000-2005, Latvia 2000-2005, Lithuania 2000-2005, Netherlands 2000-2005, Poland for 2004, Portugal 2000-2005, Slovenia 2004-2005, Spain 2001-2005, United Kingdom 2004-2005

¹⁴Bangladesh from 1985-2005, Croatia from 1997-2005, Indonesia from 2003-2005, Kazakhstan from 2003-2005, Macedonia from 1997-2005, Moldova from 2003-2005, Philippines from 1985-2004, Serbia from 2000-2005, Slovenia from 1994-2004, Tajikistan from 2002-2005 and Thailand from 1993-2004

period of time considered by the data source.¹⁵

3.2.3 Merging the five data sets

The aggregation¹⁶ of these different sources gives an unbalanced database documenting bilateral transfers from 89 countries to 46 recipient countries. There are 13865 observations (2772 observations, 4 interpolated values and 11089 constructed zeroes) for 1969 origin-destination country pairs.

The sending countries are: Algeria, Armenia, Australia, Austria, Azerbaijan, Bahrain, Belarus, Belgium, Bosnia and Herzegovina, Brunei Darussalam, Cameroon, Canada, Chad, China, Congo, Cote d'Ivoire, Croatia, Cyprus, Czech Republic, Denmark, Egypt, Estonia, Ethiopia, Finland, France, Gabon, Georgia, Germany, Greece, Guinea, Hong Kong SAR, Hungary, Indonesia, Iraq, Ireland, Israel, Italy, Japan, Jordan, Kazakhstan, Korea, Kuwait, Kyrgyzstan, Latvia, Lebanon, Liberia, Libya, Lithuania, Luxembourg, Macedonia, Malaysia, Mali, Malta, Mauritania, Moldova, Morocco, Netherlands, New Zealand, Niger, Norway, Oman, Poland, Portugal, Qatar, Romania, Russia, Rwanda, Saudi Arabia, Senegal, Serbia and Montenegro, Singapore, Slovak Republic, Slovenia, South Korea, Spain, Sweden, Switzerland, Syria, Taiwan Province of China, Tajikistan, Togo, Turkey, Turkmenistan, Ukraine, United Arab Emirates, United Kingdom, United States, Uzbekistan, Yemen.

The recipient countries are: Albania, Algeria, Argentina, Armenia, Bangladesh, Belarus, Bolivia, Brazil, Bulgaria, China, Colombia, Costa Rica, Croatia, Dominican Republic, Ecuador, Egypt, El Salvador, Georgia, Ghana, Guatemala, Indonesia, Israel, Jordan, Kazakhstan, Lebanon, Libya, Macedonia, Moldova, Morocco, Nigeria, Pakistan, Panama, Peru, Philippines, Romania, Russia, Serbia and Montenegro, Slovenia, Suriname, Syria, Tajikistan, Thailand, Tunisia, Ukraine, United States, Venezuela.

3.2.4 Couples for which migration data are missing

For many immigration countries in the remittance database, Docquier et al (2010) have collected census data on the size and structure of migration. A first problem is that migration data are only available for 1990 and 2000, while remittances data goes from 1985 to 2005. In the aggregate database, we will use the 1990 migration structure for the years 1985-1995, and the 2000 structure for the years 1996-2005.

¹⁵Algeria for 2003-2004, Egypt for 2001-2003, Morocco for 2000-2003, Tunisia for 2001-2003, Croatia for 2000-2004, Macedonia for 2003-2004, Serbia and Montenegro for 2004, Romania for 2005 and Russia for 2004

¹⁶There are 875 double triplets in the new aggregated remittances' dataset. In case a specific triplet (origin, destination and year) appears with positive values in two different original datasets we proceed in this way. We keep it since the correlation within each double is very high and perform the estimations with and without doubles using dummies in order to control for it. As expected, results are robust to the different specifications.

This should not distort too much our empirical analysis since migration data are based on sluggish migration stocks (not migration flows).

Another problem is that the migration database only documents the structure of immigration of 52 destination countries out of the 89 destinations in remittances database. For the remittances data to be consistent with the migration data, the number of migration destinations (remittances sending countries) is limited to 52 countries while the sample of migration origins does not change (i.e., 46 countries).¹⁷ For example, in the migration data set we deal with countries such as China, Russia or Tunisia are not contained into the destinations' sample. So even though remittances data from these destinations are available (such as remittances data from China to Algeria, or from Russia to Croatia, or Tunisia to Senegal), these couples cannot be considered and have therefore been excluded. Hence, the intersection of the above remittances and the migration databases gives rise to a data set going from 1985 to 2005 in which 8928 observations for 1348 country pairs are available.¹⁸ As far as remittances data are concerned, the 8928 observations include 4 interpolated values, 6569 imputed zeroes and 2355 observed positive values. Discriminating by data set, the EU database contains 3058 final observations, 328 positive observed values, 2726 imputed zeroes and 4 interpolated values (2730 missing triplets). The IMF data set contains 4834 final observations, 1620 positive observed values, 3214 imputed zeroes (3214 missing triplets) and 196 true zeroes.¹⁹ The Romanian data set contains 45 final observations, 17 positive observed values, 28 imputed zeroes (28 missing triplets). The IDB database keeps 10 final observations. The ECB data set has 981 final observations, 380 positive observed values, 601 imputed zeroes (601 missing triplets).

3.3 Other data

We use bilateral data on distance, geographical contiguity, colonial links, linguistic links. Those variables are time-invariant and come from the CEPII data which is

¹⁷The final list of 52 remittances sending countries is: Australia, Austria, Bahrain, Belarus, Belgium, Canada, Cote d'Ivoire, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Guinea, Hungary, Iraq, Ireland, Israel, Italy, Japan, Kuwait, Kyrgyzstan, Latvia, Lithuania, Luxembourg, Macedonia, Malaysia, Malta, Morocco, Netherlands, New Zealand, Norway, Oman, Poland, Portugal, Romania, Rwanda, Saudi Arabia, Singapore, Slovak Republic, Slovenia, South Korea, Spain, Sweden, Switzerland, Turkey, United Arab Emirates, United Kingdom, United States.

¹⁸As far as the timing issue is concerned, we use the yearly observations for remittances for the whole period covered (1985-2005). For migration, we have only two observations per country pair: 1990 and 2000. Given the persistence in the migration data we assume that migration in 1990 is a good approximation for real migration stocks from 1985 to 1995 and that migration in 2000 is a good approximation for real migration stocks from 1995 to 2005.

¹⁹The IMF database is the only dataset which contains true observed zeroes. Examples of triplets whose observed values are true zero are: China Latvia 2003, Philippines Denmark 2000, Thailand United Arab Emirates 1998.

based on population-weighted bilateral distances between the biggest cities at origin and destination (see Clair et al., 2004). Proxies capturing immigration policies will be explained in Section 4.4.

4 Econometric Analysis

4.1 Related Literature

The empirical specification adopted in this paper consists in a gravity model already used by Lueth and Ruiz-Arranz (2008) where the educational level of the migrants, as in Schioupou and Siegfried (2006), is introduced. In Lueth and Ruiz-Arranz (2008), one basic and two extended gravity models are estimated. The logarithmic transformation of the total amount of bilateral remittances (expressed in US dollars) is first regressed over the total and per capita gross domestic product at origin and destination plus a vector of bilateral variables such as the physical and linguistic distances between the two countries. In a first extension, the log of the bilateral stock of migrants is introduced as additional regressor and, finally, in a second extension, the log of the imports and exports, the stock market return and inflation differentials, depreciation of the home *versus* host country currency, various home and host country characteristics, and time fixed effects. The authors estimate the basic and the first extension of the above model accounting for origin and destination country (and region) fixed effects (leaving aside unobserved bilateral characteristics) and then country pair random effects (leaving aside origin and destination features). The second extension has been instead estimated with POLS. The authors find that the gravity equation is very powerful in explaining remittance flows. Indeed, in the base model, the standard gravity factors alone can explain more than half of the variation in bilateral remittance flows. As expected the size of the origin and destination countries positively affect the size of remittances, and distance has a negative effect. Contiguity has a negative or non significant effect, suggesting that sharing a border may facilitate non official transfers. Language has a positive sign suggesting that cultural affinities matter and, finally, more remittances are sent from countries with high GDP per capita to low income countries. Once the stock of migrants is added in the first extension, the authors find that the additional regressor is very significant and, as expected, positive. Finally, beyond the standard gravity factors, the authors find a number of variables to be significant in explaining remittances flows. Trade has a positive impact and, in particular, more remittances are sent from destinations of the home country's exports. Higher inflation in the home country is found to encourage more remittance flows, probably to compensate for the loss of purchasing power. The regression results also confirm that receiving countries' financial development and political stability matter.²⁰

²⁰See also Yang (2008) on exchange rates fluctuations as a source of exogenous variation in household income from remittances, Giuliano and Ruiz-Arranz (2009) for a deeper analysis on the re-

In Schioupou and Siegfried (2006), the log of bilateral remittances per migrant (obtained by dividing the log of total remittances by the migrant stock) is regressed over a vector of bilateral variables such as the differential rate of return on financial assets, income differentials (ratio of GDP per capita), and bilateral migration. Besides, another vector contains origin variables such as the skill level of the migrants (data are from OECD), income inequality, remittance costs, unofficial economic activity. Country of destination and time fixed effects are included. The authors find that GDP per capita differentials between sending and receiving countries is positively correlated with the average remittance per migrant. By contrast, interest rate differentials are not significant. A large informal economy in the paying country depresses official remittance flows. Finally and most importantly from our perspective, they find that the share of low-skill workers among migrants leads to lower remittances, suggesting that higher migrants' skill levels contribute to raise remittances.

4.2 Basic specification

The basic regression model writes as:

$$R_{ijdt} = \eta_i + \eta_j + \eta_d + \eta_t + \alpha_0 + \alpha_1 \ln M_{ijt} + \alpha_2 S_{ijt} + \alpha_3 S_{ijt}^2 + \alpha_4 \ln D_{ij} + \alpha_5 L_{ij} + \epsilon_{ijt} \quad (7)$$

where R_{ijdt} measures total remittances in US dollars from sending country i to recipient country j at time t in data set d , $\ln M_{ijt}$ is the log of the bilateral migration stock and S_{ijt} is the skill-ratio of that stock as measured by the ratio of college graduates among emigrants to the number of less educated migrants plus one,²¹ and $\ln D_{ij}$ and L_{ij} are two bilateral variables accounting for geographical and linguistic distances. Origin, destination, time and database fixed effects are included.

The estimation of the equation (7) entails various econometric issues that may lead the OLS estimation to generate inconsistent estimates. Moreover, there is a large proportion of zeros for the dependent variable (bilateral remittances) due to the fact that we constructed our comprehensive database on remittances to make it as balanced as possible, as extensively discussed in Section 3.

If OLS were to be used with the size of bilateral remittances as dependent variable, the estimates are likely to be inconsistent. One alternative is to use the natural log of bilateral remittances. However, the zero observations are dropped from the sample in such specifications since the natural log of zero is undefined. In that case, the results are likely to be biased and the impacts of the explanatory variables are likely to be underestimated due to the exclusion of low value observations from the sample and the selection issue we addressed with the triplets reconstruction and censoring. Alternatively, one can add one to the size of bilateral remittances and then take the log.

relationship between remittances and financial development using aggregate data, and Freund and Spatafora (2008) for an analysis of the determinants of formal v. informal remittances.

²¹This is similar to the migrants' skill ratio in Grogger and Hanson (2011).

However, since the log of one is zero, this results in an excessive number of zeros in the estimated dependent variable, which also leads to heteroskedasticity in the estimation. The most appropriate solution to this problem is to use Poisson regression models that rely on pseudo-maximum likelihood estimates, as argued by Santos Silva and Tenreiro (2006).²² Accordingly, we implement Poisson regressions as our preferred specification. All the Poisson models are estimated with robust standard errors to militate against a further econometric complication: this relates to the fact that Poisson maximum likelihood estimation yields consistent point estimates even when the count is not strictly Poisson distributed (i.e., in case of overdispersion). Importantly in such circumstances, the estimated standard errors will be significantly smaller than if the count was strictly Poisson. This occurs when the conditional variance is greater than the conditional mean, that is, when the assumption of equidispersion is violated.

Table 1 provides estimation results for the base model in the full sample. Three different estimators are used.²³ The first column provides OLS results when the dependent variable is expressed in log. The second column still provides OLS estimates but when the dependent variable is expressed as one plus the amount of bilateral remittances. This transformation allows us to keep the cases in which the level of remittances is equal to zero. Then the third and the fourth columns report estimates²⁴ obtained with the Poisson estimator. Looking at the third column, as expected, the stock of migrants at destination is positive and significant, as well as the skill composition of migrants at destination. Additionally, geographical distance is negative and linguistic proximity is positive, as in Lueth and Ruiz-Arranz (2008), confirming the validity of gravity factors. The quadratic term is negative and significant in the fourth column, supporting the view that the relationship between migrants' skills and remittances is inverse-U shaped, as predicted by our theoretical model. However, using our point estimates we compute that the "return point" is beyond the range of our sample, suggesting that a linear approximation (corresponding the left side of the remittances curve in Figure 1) is a reasonably good fit for the full sample.²⁵

²²For example, they show that the log linearization of gravity models leads to inconsistent estimates of the coefficients of explanatory variables such as distance.

²³From Table 2 onwards, only Poisson regressions are performed.

²⁴Like any other regression coefficient, a Poisson regression coefficient represents the change in response corresponding to a one unit difference in the corresponding predictor. The Poisson regression coefficients have to be interpreted as follows: for a one unit change in the predictor variable, the difference in the logs of expected counts is expected to change by the respective regression coefficient, given the other predictor variables in the model are held constant. If a dummy variable is present, the coefficient is equal to the difference in the logs of expected counts between the dummy variable itself and the base term, while holding the other variables constant in the model.

²⁵We obtain a value of 1875, which comes from the ratio between 0.006 and 2×0.0000016 . The return point has been calculated maximizing over the skill share of migrants and substituting estimated values from column 4 in Table 1.

Table 1: Basic model estimations in the full sample

	OLS $\ln(R_{ijdt})$	OLS $\ln(1+R_{ijdt})$	Poisson R_{ijdt}	Poisson R_{ijdt}
Log of migrants' stock	0.264*** (0.019)	1.090*** (0.025)	0.829*** (0.028)	0.83*** (0.028)
Log of distance	0.019 (0.014)	-0.009 (0.022)	-0.035** (0.017)	-0.034*** (0.016)
Common language	0.817*** (0.135)	0.063 (0.279)	0.772*** (0.137)	0.77*** (0.137)
Skill-ratio	0.003*** (0.001)	0.00028** (0.0001)	0.0004** (0.0001)	0.006*** (0.000)
Skill-ratio ²	-	-	-	-0.0000016*** (0.000)
Constant	11.701*** (1.319)	-6.478*** (0.995)	2.042 (1.090)	2.022 (1.091)
Origin FE	yes	yes	yes	yes
Dest FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
Database FE	yes	yes	yes	yes
Nb of observations	2163	8918	8918	8918
Log pseudolikelihood	-	-	-4.84E+13	-4.825E+10
F-stat/Wald chi2	47	516.92	1.65E+05	1.74E+05
R ²	0.720	0.4841	0.9106	0.9108
Hettest p-value	0.000	0.000	0.000	0.000

* Significant at the 10% level ** 5% level *** 1% level

Robust standard errors in par.

Table 2 provides Poisson estimates by data set (the numbering of the columns corresponds to the numbering of the data sets in Section 3). The stock of migrants is always positive and highly significant. Geographical distance is always negative and significant except in column IV, and linguistic proximity matters for the data sets with enough heterogeneity in this respect. Regarding our main coefficient of interest, estimation results are not stable across data sets: a higher skill ratio is positive and weakly significant in column I for the EU data set, not significant in column II for the IMF data set, positive and highly significant in column III for the Romanian data set (in line with de Sousa and Duval, 2010), and negative and significant in column IV and V for the IDB and ECB data sets, respectively.²⁶

In the following sections, therefore, we investigate whether differences in the results across data sets may be explained by differences in the composition of their samples of destination countries. More precisely, using insights from our theoretical model, we ask whether the dimensions of "restrictiveness" and "selectivity" of immigration policies in the different destinations can explain the sign and intensity of the relationship between remittances and migrants' education. Given the fact that there is currently no comparative bilateral data set on immigration policies, nor is there a synthetic or aggregate index of immigration policy restrictiveness or selectivity, we have rely on proxy measures for these dimensions. Given that different regions have different immigration policy traditions, we first use regional membership and its interactions with the migrants' skill ratio before using more specific aspects of immigration law and policy.

²⁶Evidently, the fact that our estimation results are different from Schioupou and Siegfried (2006) depend on many factors. First of all, the samples of interest are different after the creation of imputed zeroes. In their case, there are 239 observations against 981 in our case. We use Poisson estimator to account for such a large portion of zeroes while they estimate their model with an unbalanced panel estimator.

Table 2: Basic model Poisson estimations by data set

data set	I (EU)	II (IMF)	III (Rom)	IV (IDB)	V (ECB)
Log of migrants' stock	0.725*** (0.067)	0.777*** (0.037)	1.000*** (0.000)	0.194*** (0.108)	0.4269*** (0.048)
Log of distance	-0.209*** (0.032)	-0.092*** (0.020)	-0.344*** (0.000)	0.1675*** (0.000)	-0.16163*** (0.032)
Common language	1.150*** (0.300)	1.375*** (0.168)	-	-	0.07857*** (0.351)
Skill-ratio	0.001* (0.001)	-1.401 (0.0999)	1.089*** (0.000)	-1.508*** (0.146)	-0.5759** (0.237)
Constant	11.150*** (1.089)	7.9789*** (0.620)	12.131*** (0.000)	16.978*** (1.130)	12.261*** (0.999)
Origin FE	yes	yes	no	no	yes
Destination FE	yes	yes	yes	no	yes
Year FE	yes	yes	no	yes	yes
Nb of observations	3058	4824	45	10	981
Log pseudolikelihood	-1.41E+09	-3.09E+10	-169.39	-66362830	-3.49E+09
Wald chi2	2.32E+05	1.02E+06	1.27E+10	1.22E+03	1.43E+05
Prob > chi2	0.00	0.00	0.00	0.00	0.00
Pseudo R ²	0.874	0.9165	1,000	0.9854	0.9306

* Significant at the 10% level ** 5% level *** 1% level

Standard errors in parentheses.

4.3 Interactions with regional dummies

We first test whether discriminating by destination region and low-income destination status matter. We therefore extend our empirical specification by adding regional dummies for destination countries and interactions between these dummies and the bilateral skill-ratio. The extended regression equation writes as:

$$\begin{aligned}
R_{ijdt} = & \eta_i + \eta_j + \eta_d + \eta_t + \alpha_0 + \alpha_1 \ln M_{ijt} + \alpha_2 S_{ijt} \\
& + \alpha_4 \ln D_{ij} + \alpha_5 L_{ij} + \sum_r \beta_r S_{ijt} \pi_{jr} + \epsilon_{ijt}
\end{aligned} \tag{8}$$

where π_{jr} is a dummy variables equal to one if the destination country j belongs to group r . For simplicity, we have dropped the squared value of the skill ratio as the linear specification does an excellent job in fitting the data.

We distinguish five groups of destination countries ($r = 1, \dots, 5$): Persian Gulf countries (Bahrain, Iraq, Kuwait, Oman, Saudi Arabia and United Arab Emirates), EU-15 (the fifteen members of the European Union in 2000), Western offshoots (USA, Canada, Australia and New-Zeland), and either developing or rich country for the other countries according to the World Bank classification. Based on a substantial

literature,²⁷ our assessment is as follows. First, as is well-known, the member countries of the Gulf Cooperation Council (GCC) favor temporary guest worker migration and are extremely reluctant to grant permanent status to migrant workers: we thus characterize these countries as being extremely restrictive and, therefore, expect a positive coefficient for the interaction between migrants' skill-ratio and the "Gulf" dummy. Second, Europe is known for being relatively generous in terms of family reunion programs (low restrictiveness) while the non-European Anglo-Saxon countries (especially Canada, Australia and New-Zealand) are more skill-selective: we therefore expect a negative and a positive interaction term respectively for Europe (due to low restrictiveness) and the Western offshoots (due to high-selectivity). Finally, developing countries may be characterized as neither restrictive nor selective, two features that substitute one another in predicting the effect of migrants' education on remittances.

Table 3 provides regressions results introducing geographical interactions terms, with the complete set of fixed effects. All coefficient on the interaction terms are in accordance to expectations. The skill-ratio is positive and highly significant. Given that it is quite small, the sign and magnitude of the total effect of the skill ratio on remittances from different regions are fully determined by the interaction terms: largely positive in the Gulf countries, and largely negative in Europe, the Western offshoots and developing countries (due, in our interpretation, to the stronger effect of low restrictiveness in the latter case). Each geographical interaction can be interpreted in terms of marginal effect brought to the skill ratio by the nature of immigration policies at destination. In particular, the immigration policies conducted in the Gulf Countries make the skill ratio more effective at increasing remittances, while those conducted in European countries as well as in the so called Western offshoots act to reduce the amount of remittances sent back home by skilled migrants. The interaction effect can be calculated as a double difference or the double derivative of the dependent variable with respect to the two components of the interaction. Calculations considering the Poisson coefficients for the variables GCC, EU, Western offshoots and Developing alone give the following marginal effects. The net marginal effect of Gulf Countries' immigration policies on remittances is 0.172, for European' immigration policies is -0.064 , for Western offshoots' immigration policies is -0.017 and finally for developing countries -0.314 . The Poisson regression coefficients represent the change in response corresponding to a one unit difference in the corresponding predictor.

²⁷See for example Pritchett (2006) for a typology of immigration policies and characterization of these policies across regions.

Table 3: Poisson regressions with regional interaction terms

	R_{ijdt}
Log of migrants' stock	0.917*** (0.025)
Skill-ratio (SR)	0.001*** (0.0001)
SR $\times$ GCC	0.171*** (0.005)
SR $\times$ EU	-0.065** (0.0255)
SR $\times$ Western offshoots	-0.018*** (0.006)
SR $\times$ Developing	-0.315*** (0.018)
Log of distance	-0.024*** (0.015)
Common language	0.691*** (0.168)
Constant	2.224* (1.092)
Origin FE	yes
Destination FE	no (why?)
Year FE	yes
Database FE	no (why?)
Nb of observations	8918
Log pseudolikelihood	-8.353e+10
Wald chi2	94803.28
Prob > chi2	0.00
Pseudo R ²	0.8456

* Significant at the 10% level ** 5% level *** 1% level

Robust standard errors in parentheses

4.4 Interactions with policy measures

The results in Table 3 confirm our theoretical prediction that the effect of migrants' education should vary by destination groups to the extent that these groups differ in terms of immigration policies. To reinforce our conclusions, we explore other interactions with proxy measures of various dimensions of immigration policies. The extended regression equation now writes as:

$$R_{ijdt} = \eta_i + \eta_j + \eta_d + \eta_t + \alpha_0 + \alpha_1 \ln M_{ijt} + \alpha_2 S_{ijt} + \alpha_4 \ln D_{ij} + \alpha_5 L_{ij} + \sum_p \beta_p S_{ijt} \pi_{ijp} + \epsilon_{ijt} \quad (9)$$

where π_{ijp} is a set of variables capturing a dimension p of the immigration policy for the pair of countries i and j (sometimes only related to the immigration policy in the destination country j). Table 4 gives the regressions results with the different interactions.

Due to lack of data, proxies for the existence of temporary labor programs, strict entry policies, skill-biased restrictions, and family reunification programs are being constructed.

The first policy measure we introduce is a bilateral dummy for the existence after 1990 of a guest worker program in destination country j vis-à-vis origin country i (Guest). It is a bilateral variable proxying for the cost of migrating permanently. Data on the existence of guest workers programs have been gathered using various sources, notably Basok (2000), Martin (2003), McDowell (2003), and Ruhs and Martin (2008). As can be seen from Column 1 in Table 4, the skill-ratio among migrants has a positive and highly significant effect on remittances when countries have guest-worker agreements. The marginal effect of guest-worker agreements on the propensity to send remittances by skilled people correspond to 0.324.

The second immigration policy measure we introduce is the average proportion of refugees at destination (Refugees), calculated as the number of refugees at destination as a percentage of total international migration per year. Data are from UNHCR Statistical On line Population Database. In line with the literature on the determinants of international migration in a bilateral setting (Grogger and Hanson, 2011, Belot and Hatton, 2011, Beine, Docquier and Ozden, 2011, Ortega and Peri, 2009), we interpret "taking many refugees" as a sign of low restrictiveness. As can be seen from Column 2 in Table 4, the interaction between the skill-ratio and the share of refugees among migrants is indeed negative, not enough though to dominate the positive direct effect of the skill-ratio on remittances. The marginal effect of a low restrictiveness immigration policies on the propensity to send remittances by skilled people correspond to 0.042.

The third aspect of immigration policies we want to introduce is the ease of family reunion, for which we use as proxy the share of females among immigrants (Family). We compute the absolute value of the difference between the proportion of females

among migrants and one half. If the difference is small, we interpret this as pointing to the existence of relatively open and generous family reunion programs (i.e., low restrictiveness).²⁸ The data are taken from Docquier et al. (2010). As can be seen from Column 3 in Table 4, the effect is positive, as expected (i.e., more restrictive destinations are associated with skilled migrants sending relatively more remittances). The marginal effect of costly family reunion immigration policies on the propensity to send remittances by skilled people correspond to 0.234.

Finally, Column 4 in Table 4 reports estimation results using the Point System interaction term: the skill composition of immigrants at destination is interacted with a dummy variable equal to 1 if the destination country (Australia, Canada, New Zealand) has a Point System immigration policy.²⁹ As expected, the sign of the coefficient of the interaction term is negative and highly significant. The marginal effect of skill biased immigration policies on the propensity to send remittances by skilled people correspond to 0.7.

²⁸See Morrison, Schiff and Sjoblom (2008).

²⁹Since 1984, Australia's immigration policy has officially privileged skilled workers, with the candidates being selected according to their prospective 'contribution to the Australian economy'. Canadian immigration policy follows similar lines, resulting in an increasing share of highly educated people among the selected immigrants; for example, in 1997, 50,000 professional specialists and entrepreneurs immigrated in Canada with 75,000 additional family members, representing 58% of total immigration.

Table 4: Poisson regressions with interactions with immigration policies

	(1)	(2)	(3)	(4)
Log of mig. stock	0.8133*** (0.0285)	0.8178*** (0.0271)	0.8276*** (0.0280)	0.822*** (0.0278)
Skill-ratio (SR)	0.0004** (0.0001)	0.0004** (0.0001)	-0.0343*** (0.0100)	0.0005*** (0.0001)
Guest	0.0033 (0.2173)	-	-	-
SR $\times$ Guest	0.3243*** (0.0636)	-	-	-
SR $\times$ Refugees	-	-0.00004** (0.000019)	-	-
SR $\times$ FamilyCost	-	-	0.26890*** (0.0755)	-
SR $\times$ Point-syst	-	-	-	-0.700*** (0.107)
Log of Distance	-0.0321* (0.0164)	-0.0326** (0.0169)	-0.0351** (0.0170)	-0.0174 (0.0170)
Common language	0.6440*** (0.1384)	0.7570*** (0.1374)	0.7853*** (0.1380)	0.8378*** (0.138)
Constant	2.3349* (1.07)	2.0839* (1.087)	2.0655* (1.090)	- 3.242*** (1.092)
Origin FE	yes	yes	yes	yes
Destination FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
Database FE	yes	yes	yes	yes
Nb of observations	8918	8201	8796	8796
Log pseudo-likelihood	-4.77E+13	-4.72E+13	-4.83E+13	-4.792e+10
Wald chi2	160253.16	1.97E+05	1.38E+05	161670.45
Prob >chi2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pseudo R ²	0.9118	0.9102	0.9104	0.9114

* Significant at the 10% level ** 5% level *** 1% level

Robust standard errors in parentheses

5 Conclusion

This paper investigates the relationship between remittances and migrants' education both theoretically and empirically, using original bilateral remittances data. This is an important policy issue given the increasing reliance on remittances of many developing countries and the concomitant rise in migrants' skill levels due to supply-side (e.g., self-selection) and demand-side (generalization of quality-selective immigration policies of the point-system type) forces. Previous literature on this issue has been either inconclusive or produced conflicting results. While macro studies using aggregate data found a negative effect of migrants education on total remittances, studies based on bilateral or micro data found a generally positive effect of education on expected remittances (neutral at the extensive margin, and positive at the intensive margin for the sample combining eleven household surveys in Bollard et al., 2011).

This paper partly reconciles the results from previous literature by emphasizing the role of immigration policies in determining the nature of the relationship between remittances and migrants' education. We first propose a simple model of remittance behavior interacting migrants' human capital with two dimensions of immigration policies: restrictiveness, and selectivity. The model predicts that the relationship between remittances and migrants' education will be inversed-U shaped and that for a given country pair, a more skilled pool of migrants will send more (resp. less) remittances if the destination country has a more restrictive (resp. selective) immigration policy. Using a new bilateral remittances database obtained by merging various second-hand sources on bilateral remittances for a large set of country-pairs over the period 1985-2005, we test these predictions by interacting in our remittance regressions the skill composition of immigration with proxy measures for the restrictiveness and selectivity of immigration policies at destination. The results strongly support the theoretical analysis, suggesting that immigration policies determine the sign and magnitude of the relationship between remittances and migrants' education.

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