

Paris School of Economics
Université de Paris 1 Panthéon-Sorbonne

UFR 02 Economic Science
Research Master 2: Empirical and Theoretical Economics

Bilateral Determinants of International Remittance Flows: Informality and the Channel- versus Size-Effect

Sulin Sardoschau

June 6, 2014

Supervisor: Hillel Rapoport

Abstract

The main concern of this paper is to investigate the interplay between sending and recipient country characteristics that determine remittance flows and to pay particular attention to the transfer channel. The main findings of the paper confirm that there are indeed differences between factors that change the volume of remittances and factors that change the delivery channel. High levels of Social Capital, as well as a well-developed logistic infrastructure and a large shadow economy will increase the share of remittances flowing through informal channels. Understanding the factors that cause the discrepancy between recorded and actual remittances may help to reconcile the conflicting evidence on the relationship between remittances and economic growth, as well as other factors of development. Additionally, if policy makers want to promote remittances as a bottom-up development policy (no matter if they are official or unrecorded), they cannot only look at cost-factors decreasing the volume of remittances but how they affect informal flows, too.

*L'université de Paris I Panthéon Sorbonne n'entend donner aucune approbation,
ni désapprobation aux opinions émises dans ce mémoire ; elles doivent être
considérées comme propre à leur auteur*

*I would like to thank Hillel Rapoport, Agnès Bénassy-Quéré, and Lionel Fontagné
for their helpful comments.*

Content

1. Introduction.....	2
2. Informality of Remittances	4
3. Methodology	6
3.1 The Direct Approach	6
3.2 The Indirect Approach.....	8
3.3 Bilateral Costs of Remittances	11
4. Data.....	13
4.1 Data Sources	13
4.2 Descriptive Statistics.....	15
5. Estimation Results	21
5.1 Social Capital	22
5.2 Financial and Logistic Infrastructure	24
5.3 Informality	27
5.4 Subsample Regression	29
6. Conclusion	30
References.....	32

1. Introduction

During the course of the last decade, the rapid growth of recorded international remittance flows, surpassing Official Development Assistance and nearly reaching levels of Foreign Direct Investment, has created an academic and political interest in scrutinizing the determinants of these flows and their impact on economic development. The estimated amount of global remittance flows for the year 2013 reaches \$550 billion USD and may climb up to \$700 billion by 2016¹. But even these numbers are likely to be underestimated, since the recording of remittances flowing through informal channels is impossible. Especially, South-South remittance flows lack accuracy since a large share of these flows goes through family, friends and other alternative money carriers that typically do not involve any formal contracts and will thus fly under the radar of national accounts. In fact, researchers estimate the amount of informal remittances to exceed the recorded remittances by 35 to 250% (Bezard, 2002; Freund & Spatafora, 2005).

The main concern of this paper is to investigate the interplay between sending and recipient country characteristics that determine remittance flows and to pay particular attention to the transfer channel. Understanding the factors that cause the discrepancy between recorded and actual remittances may help to reconcile the conflicting evidence on the relationship between remittances and economic growth, as well as other factors of development.

Due to the lack of a macro-level data base on bilateral informal remittances, most authors rely on household surveys on the national level. Freund and Spatafora (2005) construct and estimate a model of the determinants of remittances which focuses on the cost of sending remittances through formal channels. The authors look at the presence of a dual exchange-rate, economic distortions, migration levels, and other unilateral

¹ World Bank Migration and Development Brief October 2, 2013 “Migration and Remittance Flows: Recent Trends and Outlook, 2013-2016”

characteristics. However, the authors do not include bilateral determinants of informality and have to restrict their analysis, which is based on household surveys on remittances, to only 8 countries due to the limited availability of surveys that actually capture remittance income.

Additionally, most papers analyzing the macroeconomic determinants (in time series, cross-section or panel) of remittances solely look at sending *or* receiving country characteristics (Adams, 2009; Niimi, Ozden, & Schiff, 2010; Freund & Spatafora, 2005; Gupta, 2006; Faini, 1994; Sousa & Duval, 2010). For instance, Gupta (2006) finds that the remittance growth in India over time can be explained by the increase in migration, total earnings of migrants abroad, and economic characteristics of the source country of remittances. Yet, in her time-series analysis the author does not include time-varying receiving country characteristics. The negligence towards the inclusion of bilateral determinants is often attributed to data limitations. Most papers look at aggregate remittance flows into or out of one single country. In a cross-sectional set-up will make bilateral interaction terms redundant by construction.

This paper will rivet on bilateral factors that determine the costs of informal versus formal flows for a cross-section of almost 25,000 country pairs. The paper will contribute to the existing literature by making use of a new and more complete data set on bilateral remittance flows and will thus provide a global macro-level analysis on the topic of informality. The analysis utilizes a sending and receiving fixed-effects OLS and Poisson regression and includes bilateral measures for social capital, logistic infrastructure, financial infrastructure, and the size of the informal economy to proxy for bilateral costs of informal transfer channels.

The paper is structured as follows: Section 2 discusses the literature on informality and uses some stylized facts on informal remittances to illustrate the problem of the channel versus size effect. Section 3 will discuss different methodological approaches for the

estimation of the costs of informal channels. Section 4 presents the data sources and some descriptive statistics, followed by the estimation results in section 5. Section 6 will conclude.

2. Informality of Remittances

The IMF defines remittances as follows:

*“Remittances represent household income from foreign economies arising mainly from the temporary or permanent movement of people to those economies. Remittances include cash and noncash items that flow through formal channels, such as via electronic wire, or through informal channels, such as money or goods carried across borders. They largely consist of funds and noncash items sent or given by individuals who have migrated to a new economy and become residents there, and the net compensation of border, seasonal, or other short-term workers who are employed in an economy in which they are not resident.”*²

There are various ways to transfer money through unofficial channels, going from purely private arrangements to much systematized transfers along corporate commercial lines. Pieke, Hear, and Lindley (2007) distinguish between hand carriers (family, friends, taxi drivers), dedicated money transmitters (small local businesses responding to the demand of money transfers), and remittance transfers in the context of other businesses (cash-intensive businesses, particularly outlets with good international communications facilities, offering remittance transfer services as a sideline). Additionally, in value transfers through the *hawala* system used in the Horn of Africa, the Middle East, Pakistan and Afghanistan, and the *hundi* system used in South Asia are very common. Usually, the migrant gives money to an agent in the host country, who sends the order to a

² IMF Balance of Payments Report 2012, Appendix 5, p. 272

corresponding agent in the country of origin to pay the equivalent amount to a certain individual. All of these channels have in common that they are not recorded in the national accounts and thus cannot be quantified for a large majority of countries.

In contrast to the official transfer channels, unofficial transfer mechanisms depend not only on the accessibility, speed, and cost of transmission but also on the social structure in the sending and receiving country. In their qualitative analysis of informal remittances flows Pieke et al. (2007, p.358) suggest that trust is an important factor and that unofficial money transfers “are inextricably linked with existing patterns of solidarity and reciprocity”.

Econometrically, the issue of unrecorded informal remittances has been treated similar to trade flows. The selection bias caused by the zeroes in bilateral remittance data has been addressed with Poisson Maximum Likelihood or Generalized Method of Moments estimations (Docquier, Rapoport, & Salomone, 2012; Giuliano & Ruiz-Arranz, 2009). However, these merely statistical tools cannot identify whether the zeroes and very low levels of bilateral remittance flows are actually reflecting low levels of both informal and formal remittances or if the bulk of remittances is informal and thus not comprised in the data. In order to address this problem, it is necessary to carefully analyze factors that may influence the channel rather than the volume and to include variables - beyond the traditional gravity controls - that capture the costs of formal versus informal remittances.

If policy makers want to promote remittances as a bottom-up development policy (no matter if they are official or unrecorded), they can do so by decreasing the cost of transmission. However, they cannot exclusively rely on econometric analyses that determine the costs of only formal flows. Some factors may well decrease the recorded amount of remittances and thus give the impression of being a cost-intensifying factor, whereby in reality, these factors just disproportionately favor informal flows. This is why

this analysis focuses on the disentanglement of elements influencing the volume of remittances and elements shifting remittances from one channel to another.

3. Methodology

3.1 The Direct Approach

The most straight forward approach to estimating the determinants of informal remittance flows is to utilize household surveys that contain information on the amount and the sources of the household income. Scaling up the information on the volume and the source of remittances and comparing these with the official **bilateral flows** would provide an accurate estimate for the size of informal remittances. This approach will allow estimating the impact of social capital, infrastructure, and the shadow economy on the volume and the channel of remittances in a direct manner, since it makes informality quantifiable.

However, there are many downsides to this approach. First, the availability of such information is limited. Although there are numerous household surveys all over the world that capture the households' main living conditions, most of these surveys fail to uncover the origins of remittances (if they record them at all). This makes a bilateral estimate of informal remittances impossible. Additionally, discrepancies in the time period of the surveys and missing information for many countries limit the comparability and coverage significantly and would thus not meet the ambition of a global macro-level analysis. Second, financial resources, especially non-labor income, tend to be underreported in these surveys (Ravallion, 2003), causing a significant bias when scaling up the numbers to match them with national accounts. Third, households that hold large financial resources tend to be underrepresented in the survey sample since they are particularly sensitive to confidentiality issues and may not participate in surveys or may not respond to certain survey questions.

Even though Freund and Spatafora (2005, p.6) recognize these weaknesses, they follow the direct estimation method based on household surveys in the Dominican Republic, El Salvador, the Philippines, Armenia, Bangladesh, Guatemala, Moldova, and Uganda, making rather strong assumptions on issues of representativeness and misreporting. The authors claim that “receiving remittances through informal channels is legal in most countries, so unlike activities in the underground economy, where participants seek to evade taxes, there is no direct incentive for concealment”. Furthermore, they assume that underreporting is uncorrelated with the channel of transmission in order to rule out any interplay between reported remittance amount and the informality of these flows.

Nevertheless, Freund and Spatafora’s assumptions are rather restrictive. A direct relationship between underreporting and the volume or channel of remittances cannot be ruled out completely. Households receiving remittances through informal channels are also more likely to misreport on the amount of remittances due to two possible reasons. First, informal remittances are typically an irregular source of income. While official remittances are likely to be transmitted monthly through bank transfers, informal remittances depend on the availability of other transmission channels, like friends or family visiting the country of origin and are consequently transmitted in larger and more irregular waves. This irregularity makes an accurate reporting of remittances more difficult. Second, even though receiving remittances is legal, their effect on the household’s economic situation may have consequences beyond additional tax payments. For instance, poor female-headed households may fear to reveal their true income (particularly when they receive additional unrecorded support from their husbands abroad) in order to not risk losing financial assistance from their governments.

It is thus desirable to develop an approach that makes use of the completeness and the coverage of macro-level data and to carefully distinguish between determinants that influence the volume or the channel of remittances.

3.2 The Indirect Approach

So far, the literature has restricted itself to estimating the effect of traditional gravity variables on the volume of recorded remittances. Well aware of the limitations of the data, still, the effects of interest rates, exchange rates, political instability and other factors have constantly been interpreted as elements decreasing or increasing remittances in total. This does not give space to alternative interpretations, namely that these factors may only change the delivery channel rather than influencing the total amount (El-Sakka & R., 1999; Adams, 2009; Higgins, Hysenbegasi, & Ponzio, 2004). Thus, it is very important to interpret the results with caution and to include variables that are more likely to impact the costs of informal remittances, rather than formal remittances, in order to account for changes of the channel versus changes in volume.

Remittances are influenced by factors in the sending and the receiving country respectively but are also dependent on the interplay between the two countries. When trying to detect the costs of informal remittances, it is not sufficient to analyze characteristics of solely the sending or receiving country. For instance, financial depth and accessibility of financial institutions in the migrant's host country are undoubtedly an important and cost-decreasing factor for official remittances. However, if the household in the migrant's origin country has no means to access a bank account or if the costs of access are too high, the importance of financial depth in the host country is virtually zero.

Nevertheless, the large majority of the specifications in the remittance estimation exclusively look at either sending or receiving country characteristics (Lueth & Ruiz-Arranz, 2008; Freund & Spatafora, 2005; Niimi, Ozden, & Schiff, 2010). This unilateral approach neglects the mutual importance of both the sending and the receiving country.

Contrary to the remittance literature, scholars analyzing international trade flows have been more aware of the importance of bilateral determinants of trade. Rauch and Trinade

(2002) were the first ones to specifically look at bilateral determinants of trade - beyond the traditional gravity variables like distance or regional trade agreements. The authors do so by interacting characteristics of the sending country with those of the receiving country. Specifically, Rauch and Trinade multiply the ethnicity share in the two countries to proxy for the probability that two randomly selected members of each population would encounter each other. This approach is motivated by the idea that trade is more likely when conducted by an exporting firm who is managed by someone of the same ethnicity of the corresponding importer.

This paper will apply a similar strategy by creating a dyadic variable that interacts measures for social capital, financial or logistic infrastructure, and the size of the informal economy in the sending and the receiving country. Combining the characteristics of both countries will give a more accurate picture of the actual costs accruing to the transmission of remittances. The choice in favor of formal remittance channels not only depends on the costs occurring in country i but also on the costs and risks arising in the destination country.

The only paper using a constructed bilateral variable to estimate remittances is Frankel (2011). Based on the data set of Lueth and Ruiz-Arranz (2008), Frankel confirms the smoothing hypothesis, that is to say that remittances are countercyclical with respect to income in the worker's country of origin (the recipient of the remittance), while procyclical with respect to income in the migrant's host country (the sender of the remittance). For the purpose of this analysis he constructs a bilateral variable that measures the difference in the cyclical position of the host relative to the origin country. However, as an additional control variable Frankel only uses the GDP of the sending country, not that of the receiving country. The significance of the results may thus be driven by variation of the economic cycles in the receiving country, rather than the difference in economic cycles of both host and origin country.

In order to rule out any doubts about possible unilateral sources of variation, the estimation will include sending and receiving country fixed effects. In fact, the paper seeks to extract the pure effect of bilateral determinants, independent of the variability in unilateral factors like GDP, trade openness, population, geographic condition and other variables. Consequently, the regression will follow a sending and receiving country fixed effects estimation with only bilateral determinants of remittances. This approach has two main advantages. First, estimating gravity equations with importer and exporter fixed-effects does not involve strong structural assumptions on the underlying model and will yield consistent estimates for the vector of bilateral characteristics, especially in a cross-sectional setting (Head & Mayer, 2013). Second, the fixed-effects estimation rules out systematic tendencies of exporters and importers since it will account for any unobservable factor that contributes to the overall level of remittances. This will thus decrease the risk of running into an omitted variable bias. Head and Mayer (2013, p. 25) support the utilization of fixed effects models in cross-sectional gravity settings in saying that “the gravity equation with fixed effects is now common practice and recommended by major empirical trade economists”.

The estimable equation writes as follows:

$$\ln(R_{ij}) = \alpha_0 + \alpha_1 G_{ij} + \alpha_2 X_{ij} + \gamma_i + \delta_j + \varepsilon_{ij}$$

The basic empirical specification is adopted from other gravity models of remittances used in the literature (Lueth & Ruiz-Arranz, 2008), where the dependent variable is the logarithm of total remittances in US Dollars flowing from country i to country j . G_{ij} is a vector of traditional gravity variables including the log of the physical distance between country i and country j , the log of the total migrant stock from country j hosted in country i , a dummy for any colonial ties in the past and a dummy for a common official language. Other traditional gravity variables, such as population size or landlocked country

dummies are captured by the country fixed effects and do not need to be included explicitly in the regression.

The non-traditional vector of control variables \mathbf{X}_{ij} is multi-dimensional and addresses factors that are likely to not only influence the volume of remittances but are of particular importance for the channel of delivery. It incorporates the infrastructure of the financial market, the logistic infrastructure, the level of social capital and corruption, and proxies for the size of the shadow economy. All of these variables are designed as interaction terms of characteristics of both sending and receiving country.

Moreover, this analysis will pay particular attention to the interpretation of the estimation results. It is clear that the analysis can only give indicative evidence for the impact of bilateral characteristics on the channel of remittances since there is no direct measure of informal flows. However, the paper will be the first one to carefully differentiate between factors that may change the total volume of remittances and factors that shift remittances from one delivery channel to the other. Thus, it is necessary to build a strong economic intuition behind the expected direction of impact and to match this intuition with the results of the estimation procedure.

3.3 Bilateral Costs of Remittances

High levels of financial development are expected to increase the share of remittances channelled through formal flows as it decreases the relative costs of financial access. Evidently, the recipient household needs to hold an official bank account in order to be able to receive official remittances. Moreover, if sending and receiving countries are financially open, typically these two countries have established various means of financial transfers that have proven to be accessible and efficient. Thus, the costs of gaining access to these tools are usually lower and will thus shift remittances from informal to formal

channels. In general, a well-developed financial infrastructure will decrease the share of remittances flowing through informal channels.

On the other hand, a well-developed infrastructure will equally decrease the costs of informal flows. As informal remittances are usually transferred via friends and relatives, the rural-urban connectedness and means of transport are important determinants for the costs of informal remittances. For instance, if a remote village on the countryside is hardly accessible to the courier of the remittances, it may be more feasible for the recipient household to undertake a monthly trip to a bank in an urban area nearby and receive official transfers through their bank accounts rather than unofficial remittances through family and friends.

Consequently and equally important as the financial infrastructure, the logistic infrastructure needs to be strong as well, in order for informal flows to be more cost-efficient. Since the logistic and the financial infrastructure are likely to be correlated, the effect of these measures is a priori ambiguous.

Another important determinant for the costs of informal flows is the trust between individuals in both societies. High levels of distrust among citizens will increase the cost of remittances. Again, it is important to look at social capital in both countries since the decision on which channel to use for transmission depends on the trust in the local society and the destination society.

Many studies show that informal remittances are not only transferred through close friends and relatives but also through other types of couriers. In South Africa, for instance, two informal tools seem to predominate: using friends and taxi drivers as money carriers (Analytics-Genesis, 2003). If the general distrust is high among members of the society, then the remitter faces a higher risk to use these informal channels (such as taxi drivers or

private carrier systems) and may switch to formal remittance flows which demand only very few interactions with other individuals.

Lastly, informal remittances will be more likely in countries that have a pronounced shadow economy. When informality of employment, production and financial transactions is common in both sending and receiving countries this will strengthen the infrastructure for informal money transfers and thus decrease the cost of informal remittances. Consequently, large shadow economies are expected to shift money from official to non-official channels.

4. Data

4.1 Data Sources

Since 2010, the World Bank annually publishes a data set on bilateral remittance flows between 212 countries. This paper makes use of the data set on remittances in 2011, which comprises bilateral remittance flows in current USD for 24,647 country pairs.

The right-hand side variables include measures for the quality of the financial market, quality of logistic infrastructure, social capital, and the shadow economy.

The measures for the quality of the financial market are two-fold. First, financial accessibility as measured by the share of adults with an account at a formal financial institution. Second, financial openness, as measured by the Chinn-Ito Financial Openness Index (Chinn & Ito, 2008). The index is aimed at measuring the extensity of capital controls based on the information from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). It takes on negative and positive values and is constructed around a zero mean. The index takes higher values the more open the country is to cross-border capital transactions. For the purpose of this paper, the Chinn-Ito Index is not centered around the zero mean, but shifted to only take positive

values since a multiplication of the negative Index in country i and country j would yield a misleading positive combined financial openness index.

Turning to the logistic infrastructure, the paper makes use of two different measures. On the one hand, a systemic measure of logistic infrastructure, namely the World Bank Index of Port Infrastructure, that ranges from 1 (=extremely underdeveloped) to 7 (=extremely developed) and on the other hand a direct proxy for the accessibility of remote rural areas, captured by the road density as kilometers of road per 100 square kilometers of land area.

All of the measures for financial and logistic infrastructure with the exception of the Chinn-Ito-Index are taken from the World Bank's World Development Indicator Database for the year 2011. Traditional bilateral gravity controls are taken from the French research center in international economics, CEPII.

Proxies for social capital are taken from two main sources. Transparency International's Corruption Perception Index (CPI), which is an annual ranking of countries by their perceived levels of corruption, as determined by expert assessments and opinion surveys. The CPI currently ranks 176 countries on a scale from 100 (very clean) to 0 (highly corrupt). An additional measure of social capital is taken from the World Value Survey, which consists of nationally representative surveys conducted in six waves from 1981 to 2014. Survey participants are asked, among other things, if they agree or not agree with the statement that generally "most people can be trusted". The average positive response rate to this question is used as a proxy for social capital in the society and is available for 50 countries in the wave between 2010 and 2014.

Estimates for the shadow economy as a share of total GDP are taken from Schneider (2005), comprising data for 161 countries in the year 2000, reaching from 9% to over 70% in Sub-Saharan Africa.

4.2 Descriptive Statistics

The highest bilateral channel of remittances is between the United States and Mexico and reaches almost 23 Billion USD in 2011. The majority of official bilateral remittances - more than 70 percent - are zero. The main passages of zero remittances are between countries in Sub-Saharan Africa and also from high income OECD countries to countries in Sub-Saharan Africa. Those two channels constitute more than 10% of total zero flows. In general, Sub-Saharan Africa as well as Latin America and the Caribbean are the regions that seem to neither send nor receive remittances. However, the size of the migrant community would predict otherwise. Typically, remittances rise proportionately to the migrant stock (see Figure 1) but although Latin America and the Caribbean have the third largest stock of migrants in the world, they still belong to the world regions that are not sending remittances at all (see Table 1 and Table 2).

Figure 1: Scatterplot of log of Remittances and log of total Migrant Stock

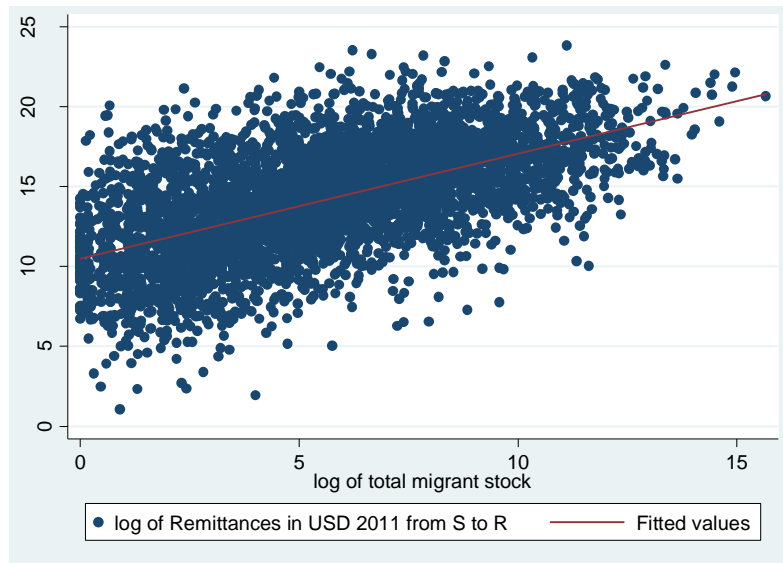


Table 1: Zero Bilateral Remittance Flows by Sending and Receiving Regions

Receiving Regions	Freq.	Percent	Sending Regions	Freq.	Percent
Sub-Saharan Africa	4,123	23.29	Sub-Saharan Africa	5,178	29.25
Latin America & the Caribbean	3,179	17.96	Europe and Central Asia	2,734	15.44
High-income OECD members	3,097	17.49	Latin America & the Caribbean	2,613	14.76
Europe and Central Asia	2,271	12.83	East Asia and Pacific	2,290	12.94
East Asia and Pacific	1,886	10.65	Middle East and North Africa	1,613	9.11
Middle East and North Africa	1,191	6.73	High-income non OECD members	1,206	6.81
High-income non OECD members	1,072	6.06	South Asia	1,189	6.72
South Asia	884	4.99	High-income OECD members	880	4.97
Total	17,703	100	Total	17,703	100

Table 2: Migrant Stocks (in Millions) in Regions Sending and Receiving Remittances

Receiving Regions	Percent		Sending Regions	Percent	
High-income OECD members	49	53	Europe and Central Asia	23	25
Europe and Central Asia	17	18	High-income OECD members	18	19
South Asia	8,1	9	Latin America & the Caribbean	14	15
Sub-Saharan Africa	7,4	8	South Asia	13	14
High-income non-OECD members	5,8	6	Sub-Saharan Africa	8,8	10
Latin America & the Caribbean	2,4	3	East Asia and Pacific	8,5	9
Middle East and North Africa	1,6	2	Middle East and North Africa	5,6	6
East Asia and Pacific	1,2	1	High-income non-OECD members	1,6	2

Consequently, the question arises: why do these regions not send or receive any remittances, despite the noticeable migrant community? Most likely, there are two factors at play. First, the low levels of financial accessibility in these countries may increase the cost of remittances to a point, where the transfer of money is not feasible anymore (volume effect). Second, high social capital and a well-developed informal economy may decrease the cost of informal flows to a point, where it is less costly to send remittances through unrecorded channels (channel-effect). Officially, these remittance channels appear as zero, because the bulk of remittances flows through informal channels.

A closer look at some key variables that determine the cost of remittances reveals that country pairs that do not have any recorded transactions are on average less financially open and accessible and are logistically less developed. They are also typically more corrupt and have a larger shadow economy (see Table 3). This supports the initial observation that particularly countries in Sub-Saharan Africa and Latin America and the Caribbean remit very little.

Table 3: Differences in Key Variables for zero remittances and positive remittances

	zero remittances	positive remittances
Financial Accessibility (bank accounts per 1000 adults)	38.46	66.61
Logistic Accessibility (km of road per 100 sq. km of land area)	79.36	105.50
Infrastructure (World Bank Index of Port Infrastructure)	3.94	4.75
Social Capital (Corruption Perception Index)	38.51	57.70
Financial Openness (Chinn-Ito Index)	2.15	3.50
Informality (size of the shadow economy as share of GDP)	38.74	29.38

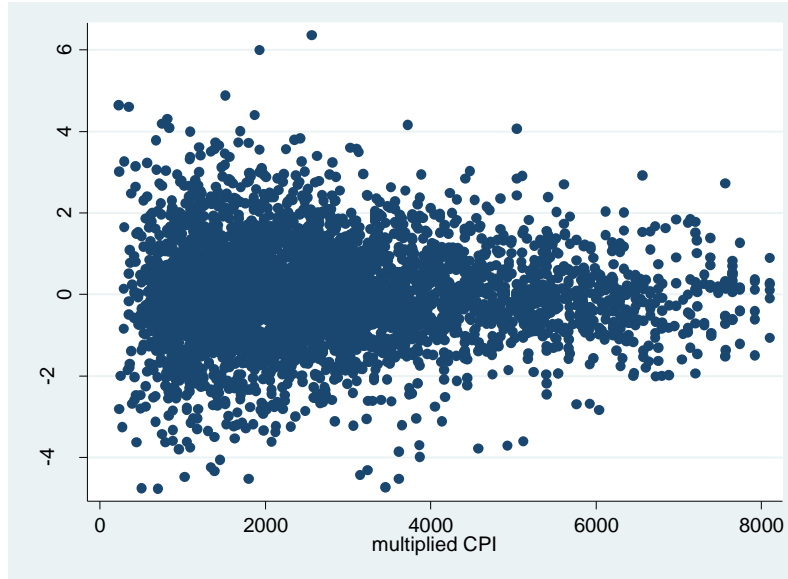
Usually, gravity equations on remittances include vectors of unilateral characteristics for either the sending or receiving country, such as GDP, geographic, and demographic determinants. The vector of bilateral variables usually includes the migrant stock, the physical distance, and dummies for the same language and colonial ties. Replicating those standard regressions with the help of sending and receiving country fixed effects (instead of the unilateral variables vectors) and analyzing the residuals of the standard gravity estimation, will shed some light on what may have been overlooked. This method will also validate the choice of the key variables determining costs of remittances that have previously remained unnoticed.

Figure 2 shows that the accuracy of the standard gravity estimation decreases with high levels of corruption (high CPI is equivalent to low corruption). That is, in countries where both recipient and sender are highly corrupt the standard model fails to account for

a large share of the variation in the data. This confirms the prior of the paper on the fact that social capital is an important component when analyzing the cost of remittances.

Additionally, when looking at the country pairs that exhibit large residuals, it becomes evident that these pairs usually have very particular relationships. These connections cannot only be captured through cultural or geographic proximity. Figure 3 takes two examples of country pairs whose actual remittance values differ largely from the estimated flow. On the one hand, there is the flow between Israel and Lebanon which is typically overestimated by the standard gravity equation and on the other hand the flow between the United States and Mexico that tends to be underestimated by the traditional gravity estimation. Again, these large inaccuracies occur because important bilateral determinants of remittances are omitted in the standard estimation.

Figure 2: Residuals of standard gravity estimation with FE and the combined level of corruption

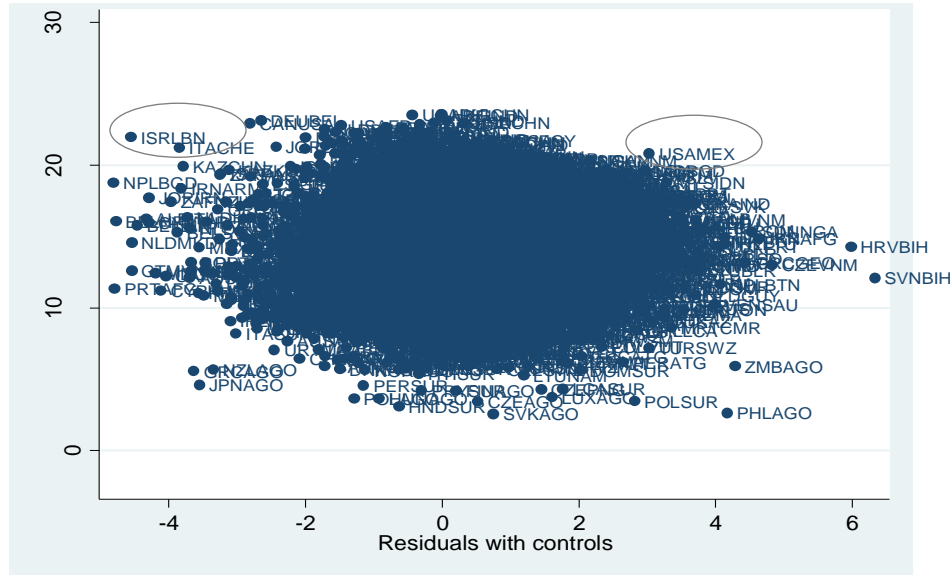


The geographic proximity of Lebanon and Israel may lead to believe that these two countries must engage in extensive remittance transaction. However, this ignores the socio-

political determinants of those interactions. Indeed, the combined CPI for Lebanon and Israel lies well below the mean level of combined CPI for the full sample, indicating that the level of general trust in a society is an important determinant.

Conversely, remittance flows between the United States and Mexico cannot solely be explained by the high stock of Mexican migrants in the US. There needs to be an additional factor that intensively promotes remittances between these two countries. Since US-Mexico migration has become one of the main channels of remittances and migration in the world more efficient and less costly channels of delivery may have been developed over time as a response to the great demand for financial institutions. It is therefore expected that not only the official flows are underestimated by the model, but also that the large share of remittances might flow through informal channels. A strong and well-connected diaspora and a developed logistic and financial infrastructure facilitate the establishment of informal transmission arrangements.

Figure 3: Residuals of standard gravity estimation with FE and Fitted Values, corrected by the mean residual of the sending country



Furthermore, the literature on trade potential can be useful in analyzing possible remittance flows. The difference between the observed and the predicted trade flows are typically interpreted as un-exhausted trade potential (Egger, 2002; Wang & Winters, 1992). Applied to the remittance context, all country pairs that exhibit a negative residual, that is whose remittance flows are overestimated, channel the difference between actual and predicted remittances through informal channels. Table 4 lists the country pairs with the highest discrepancies between actual and estimated remittance amount. Following the logic on trade potential, the right column of Table 4 predicts the country pairs with the highest informal flows. Consequently, we would expect that the informal remittance flows are the highest for Lebanon and Israel and Nepal and Bangladesh.

Table 4: Country Pairs with highest residuals

Underestimation (positive residual)		Overestimation (negative residual)	
Sending	Receiving	Sending	Receiving
Croatia	Bosnia and Herzegovina	Belgium	Croatia
Czech Republic	Vietnam	Guatemala	Vietnam
Iran	Afghanistan	Israel	Lebanon
Slovenia	Bosnia and Herzegovina	Nepal	Bangladesh
Sudan	Nigeria	Portugal	Afghanistan

With the exception of a few, most country pairs are either neighboring countries or only separated by one country. Apparently, some other forces are at play between these countries that cannot be explained by the physical distance. The following estimation will include bilateral, cost-determining factors that have been overlooked in the standard gravity equations. This may help to shed some light on particularities of certain country pairs.

5. Estimation Results

This section will apply the methodology described in section 3.2. For reasons of robustness, section 5 will report on the results of receiving country fixed effects, sending and receiving country fixed effects, and estimations for different subsamples, particularly South-South and North-North passages of remittance flows and estimations of remittances flowing between neighboring countries. Both Ordinary Least Squares and the Poisson Pseudo Maximum Likelihood methods will be applied as suggested by Silva and Tenreyro (2005) to deal with the selection bias caused by the log-linearization of zero remittance values.

For all regressions for social capital, financial and logistic infrastructure, as well as informality the traditional gravity variables are significant and exhibit the expected sign. The higher the migrants stock from country j hosted in country i , the higher the remittances. Similarly, past colonial ties between country pairs or having the same official language will also increase remittance flows. The coefficient of physical distance between countries, as a proxy for transport costs, is significant throughout all specifications and exhibits the expected negative sign. Both the migrant stock and the geographic distance are in logs and can be interpreted as elasticities (that is a one percent increase in the migrant stock will increase total official remittances by about 0.5%).

All of the key indicators are in absolute terms and not in logs since most of them represent shares and are thus limited to a maximum value of 1. Log-linearizing values below one would turn them negative and a large share of the variation would be lost through the log-linearization. With this approach we follow the specification conventions in the trade literature and particularly rely on Head and Mayer (2013) and Rauch and Trinade (2002).

5.1 Social Capital

As suggested in previous sections, social capital is one of the main determinants for the cost of formal and informal remittances and is expected to favor informal flows, as it decreases the risk of transmitting money through alternative channels like taxi drivers.

Table 5 reports the estimation results for social capital, using the Corruption Perception Index and the World Value Survey as proxies. Consistently, in all four models, the interacted Corruption Perception Index is negative and significant at the 1 to 5 percent level. This suggests that lower levels of corruption and higher levels of trust among individuals decrease the flows of official remittances. This result holds even if one controls for the level of income in both sending and receiving country, which rules out the doubt that a high CPI merely reflects high income pairs that naturally exhibit low levels of remittances.

The result is in line with the observations of Pieke, Hear, and Lindley (2007), who show that trust is an important cost-decreasing factor of informal remittances. High levels of trust in both host and origin country of the migrant will decrease the cost of informal flows and thus shift remittances from the formal to the informal channel.

Considering the World Value Survey (WVS), which measures the share of people in a country that agree with the statement that in general people can be trusted, the results are consistently insignificant. Although exhibiting a negative sign and thus in line with the theory, using the WVS is not sensible due to the limited availability of data. The observations decrease from more than 4000 for the combined CPI to only 600 for the WVS. This lack of coverage and the selection bias caused by the availability of information (WVS only available for high- and middle-income countries) leads to a biased estimate that shall not be considered in the further analysis.

Table 5: Social Capital Estimation Results

	CPI		WVS		CPI		WVS	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	Poisson	OLS	Poisson	OLS	Poisson	OLS	Poisson
GDP i	0.631***	0.0432***	0.997***	0.0642***				
Population i	-0.426***	-0.0316***	-0.842***	-0.0540***				
Area i	0.139***	0.0095***	0.143***	0.0089**				
Landlocked i	-0.215***	-0.0188	-0.156	-0.0108				
Migrant Stock ij	0.489***	0.036***	0.446***	0.029***	0.417***	0.0316***	0.3398***	0.0236***
Distance ij	-0.625***	-0.039***	-0.575***	-0.0376**	-0.6719***	-0.0422***	-0.6756***	-0.0420**
Colony ij	0.762***	0.0385**	0.681**	0.0348	0.890***	0.0488**	0.5251**	0.0269
Language ij	1.254***	0.0876***	0.970***	0.0633**	0.841***	0.0592***	0.9218***	0.0581
Social Capital i	0.0263***	0.0021***	2.3032***	0.1709				
Social Capital ij	-0.000185***	-0.0000194**	-1.937551	-0.1701	-0.000178***	-0.0000203**	-1.9865	-0.16962
Observations	4177	4177	600	600	4242	4242	600	600
R-squared	0.7622	0.1155	0.7612	0.1001	0.8594	0.1301	0.8687	0.1129
Sending Country FE	No	No	No	No	Yes	Yes	Yes	Yes
Receiving Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

5.2 Financial and Logistic Infrastructure

In section 3, the paper has already constituted that the economic intuition behind the financial and logistic infrastructure is ambiguous, since a well-developed infrastructure will help both formal and informal remittances to be more cost-efficient.

The estimation results mostly confirm that the bilateral financial and the logistic infrastructure variables decrease the official remittance flows. Whereas this may be surprising for the financial accessibility variable (more bank accounts means better access to formal remittances), a second look at the data helps to solve this puzzle. Financial accessibility is strongly and significantly correlated with other proxies for logistic infrastructure. The variation in financial accessibility may thus reflect large parts of the variation of the logistic infrastructure measures.

The Chinn-Ito Index for financial openness seems to present a similar puzzle: If both countries are more financially open the official flow of remittances decreases. However, the Chinn-Ito Index does not measure openness towards official flows but openness in terms of capital controls. A high Chinn-Ito Index is equivalent to low restrictions (on the acquisition of currencies, for example). Non-restrictive monetary policies liberalize the transactions and lead to a less intense control of financial transactions, which makes unofficial transfers easier.

The negative sign of the port infrastructure index and the road density confirm the hypothesis that rural-urban connectedness and an efficient logistic system helps to decrease the cost of informal remittances. This channel effect seems to overweigh the volume effect, since the better infrastructure seems to decrease rather than increase the recorded formal flows. These results show how important a careful interpretation of these variables is, since a well-developed infrastructure does not necessarily mean lower remittances, but that these remittances may just be transferred informally.

Table 6a: Financial and Logistic Infrastructure Estimation Results

	Bank Accounts		Chinn Ito Index		Port Infrastructure		Road Density	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	Poisson	OLS	Poisson	OLS	Poisson	OLS	Poisson
GDP i	0.589***	0.0389***	0.799***	0.056***	0.636***	0.044***	1.014***	0.068***
Population i	-0.490***	-0.033***	-0.611***	-0.044***	-0.416***	-0.0314***	-0.847***	-0.0580***
Area i	0.177***	0.011***	0.136***	0.0092***	0.156***	0.0105***	0.149***	0.0094***
Landlocked i	-0.408***	-0.031**	-0.269***	-0.020*	0.081	0.0038	-0.1757**	-0.0133
Migrant Stock ij	0.492***	0.0353***	0.517***	0.037***	0.4997***	0.0362***	0.4791***	0.0327***
Distance ij	-0.581***	-0.037***	-0.556***	-0.034***	-0.535***	-0.0330***	-0.422***	-0.028***
Colony ij	0.574***	0.023	0.741***	0.036**	0.764***	0.0368**	0.651***	0.0313
Language ij	1.358***	0.093***	1.269***	0.0902***	1.119***	0.0765***	1.342***	0.084***
Infrastructure i	0.0187***	0.0014***	0.0768*	0.0073	0.7082***	0.0554***	0.0019***	0.0001454
Infrastructure ij	-0.000085***	-0.0000084*	0.00745	-0.00031	-0.0634***	-0.00588	-0.000018***	-0.00000148**
Observations	3506	3506	4179	4179	3715	3715	1994	1994
R-squared	0.7501	0.1082	0.7611	0.1177	0.7738	0.1118	0.7540	0.0886
Sending Country FE	No	No	No	No	No	No	No	No
Receiving Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 6b: Financial and Logistic Infrastructure Estimation Results

	Bank Accounts		Chinn Ito Index		Port Infrastructure		Road Density	
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	OLS	Poisson	OLS	Poisson	OLS	Poisson	OLS	Poisson
Migrant Stock ij	0.418***	0.0309***	0.431***	0.032***	0.419***	0.0313***	0.452***	0.0317***
Distance ij	-0.706***	-0.0458***	-0.683***	-0.042***	-0.629***	-0.0391***	-0.701***	-0.0454***
Colony ij	0.809***	0.0403*	0.861***	0.047**	0.932***	0.0503**	0.677***	0.0355
Language ij	0.842***	0.0587***	0.836***	0.059***	0.747***	0.0498***	0.619***	0.0389
Infrastructure ij	-0.000092***	-0.000010**	-0.034***	-0.0038***	-0.0654***	-0.0065**	-0.00002***	-0.00000169**
Observations	3506	3506	4179	4179	3715	3715	1994	1994
R-squared	0.8560	0.1232	0.8701	0.1327	0.8659	0.1297	0.8688	0.1012
Sending Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Receiving Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

5.3 Informality

The size of the shadow economy of a country is likely to be the most direct measure for the channel effect. The average size of the shadow economy (in percent of official GDP) over 1999-2000 in developing countries is 41%, in transition countries 38% and in OECD countries 18.0%. This is in line with the presumption that especially in developing countries (and in particular Sub-Saharan Africa and Latin America and the Caribbean) informal remittance flows are high. Schneider (2005) finds that the increasing burden of taxation and social security contributions combined with rising state regulatory activities are the driving forces for the growth and size of the shadow economy. Similar forces stand behind the choice to remit through the informal channel. Consequently, the size of the shadow economy is a good proxy for the size of informal flows.

The estimation confirms this hypothesis. The size of the informal economy consistently decreases official remittance flows, in both simple OLS and the Poisson estimation and is highly significant throughout all specifications. This may be driven by two factors, a direct and an indirect effect of the shadow economy. First, a strong informal economy can only exist if the infrastructure for informal transactions of labor and capital are also well-developed. Informal remittance flows can benefit from these existing structures which decrease the cost of transfer (direct effect). Second, a strong informal economy is reflecting a specific socio-political set-up. On the one hand, the state is strong enough to impose taxes and social contributions for official contractual employment relations, on the other hand the state is too weak to limit illegal employment and to control the black market. Thus, a large shadow economy is only a symptom of this particular socio-political set-up which incites informal remittances and at the same time offers fruitful ground for them (indirect effect). Both effects are clearly determining the channel of transfer rather than the volume. In other regressions (not reported) alternative measures of informality, such as the share of informal employment over total employment, showed no significance.

However, this can be attributed to the low coverage of data: informal employment statistics are only available for 33 countries.

In order to rule out any mechanisms of the shadow economy on remittances that go through corruption, this paper makes use of the results of Dreher and Schneider (2010) who find that there is no robust relationship between corruption and the size of the shadow economy when perceptions-based indices of corruption are used. We can thus be confident that the shadow economy accurately reflects remittances switching from one channel to another and that they do not decrease the volume of remittances through higher levels of corruption.

Table 7: Estimation Results Shadow Economy

	Informality			
	(1) OLS	(2) Poisson	(3) OLS	(4) Poisson
GDP i	0.615***	0.0412***		
Population i	-0.517***	-0.0374***		
Area i	0.157***	0.0108***		
Landlocked i	-0.385***	-0.0311**		
Migrant Stock ij	0.503***	0.0368***	0.4222***	0.0317***
Distance ij	-0.585***	-0.0373***	-0.6896***	-0.0432***
Colony ij	0.703***	0.0347**	0.8704***	0.0477**
Language ij	1.232***	0.0844***	0.7719***	0.0537***
Informality i	-0.0133***	-0.00070		
Informality ij	-0.00037***	-0.000037**	-0.0004136***	-0.0000438**
Observations	4061	4061	4098	4098
R-squared	0.7664	0.1157	0.8613	0.1296
Sending Country FE	No	No	Yes	Yes
Receiving Country FE	Yes	Yes	Yes	Yes

5.4 Subsample Regression

The main prior of the paper is that the official statistics on remittances do not reflect the real financial flows between two countries. This is particularly the case for country pairs that have very low costs for informal flows and for country pairs that have no access to formal transmission channels. Hence, one can expect that for these countries actual and reported remittance data deviate very strongly from each other. This large data inaccuracy is expected to cause a loss of significance of the key variables (social capital, infrastructure, and informality).

Table 8: Subsample Regression with rich, poor, neighboring and non-neighboring country pairs

	Above Median Combined GDP		Below Median Combined GDP		Neighboring Countries	Non-Neighboring Countries
	(1) OLS	(2) Poisson	(3) OLS	(4) Poisson	(5) Poisson	(6) Poisson
Bank Accounts	-0.0001506***	-0.0000142***	0.000208	0.0000282	0.0000142	-0.0000119**
Chinn-Ito Index	-0.060792***	-0.0059251**	-0.0020856*	0.0005882	-0.0008588	-0.0047476**
Port Infrastructure	-0.061707***	-0.0061529*	-0.0509597	-0.0042332	-0.0162372	-0.0068429**
Road Density	-0.0000201***	-0.00000162**	-0.00000607	0.00000127	-0.000000337	-0.00000162**
CPI	-0.0002074***	-0.0000214**	0.0003953	0.0000383	0.000048	-0.000023**
Shadow Economy	-0.0004228***	-0.0000417**	-0.0000361	-0.00000163	0.0000082	-0.0000505***

To confirm this hypothesis, the key regressions from section 5.1 to 5.3 are replicated using subsamples for country pairs that have little access to formal transmission channels. Country pairs that are below the median level of combined GDP are most likely to be less financially developed and typically have high costs of accessing formal means of transfer. Conversely, neighboring country pairs are expected to have very low costs of informal

transfers, beyond the mere geographic proximity. For instance, temporal labor migration among neighboring countries that are not officially recorded and frequent back and forth movement across countries favor informal flows. Additionally, transferring money to the neighboring country does not necessarily require the involvement of money carriers or other intermediate stages of transfers, which lowers the requirements towards social capital and other key cost-determining factors.

The subsample regressions confirm that the significance mainly stems from country pairs that are above the median of interacted GDP and non-neighboring countries. All the key variables have the expected negative and significant coefficient in both the Poisson and the OLS regressions for North-North and non-neighboring passages of remittance flows. This supports the initial expectation of the paper that the data is most inaccurate for country pairs that have high costs for formal remittances and very low costs for informal remittances³.

6. Conclusion

The aim of this paper was to investigate the interplay between sending and recipient country characteristics that determine remittance flows. Expanding the interpretational framework of previous papers, the analysis paid particular attention to the transfer channel when interpreting the estimation results.

Using a sending and receiving country fixed effects estimation and including newly constructed bilateral determinants of trust, financial and logistic infrastructure and informality, the paper spotlights the mutual importance of both countries when determining the cost of remittances. Applying methods from the trade literature, the estimation results confirm that high levels of social capital, a well-developed infrastructure

³ Subsample regressions on remittance passages among only OECD countries, or only non-OECD countries, as well as passages between rich and poor countries (not reported) did not yield any consistent differences in significance.

and a strong informal economy contribute to switching from one channel of delivery to the other.

Policy makers can try to promote remittances by strengthening factors that decrease the cost of both formal and informal flows, without being misled by the fact that some elements only change the transmission channel rather than decreasing or increasing the full volume. Additionally, papers that try to analyse the effect of remittances on economic development should include bilateral cost-factors in order to control for the channel versus size effect.

References

- Adams, R. H. (2009). The Determinants of International Remittances in Developing Countries. *World Development* 37, pp. 93-103.
- Analytics-Genesis. (2003). "*African Families, African Money: Bridging the Money Transfer Divide*. Retrieved 5 27, 2014, from Study prepared for UK Department for International Development and Finmark Trust: <http://www.livelihoods.org/hot`topics/docs/FinMarkRemit.pdf>
- Bezard, G. (2002). *Global Money Transfers: Exploring the Remittance Gold Mine*. Retrieved 5 27, 2014, from Celent Communications LLC: <http://www.celent.net>
- Chinn, M. D., & Ito, H. (2008). A new measure of financial openness. *Journal of Comparative Policy Analysis* 10.3, pp. 309-322.
- Docquier, F., Rapoport, H., & Salomone, S. (2012, September). Remittances, migrants' education and immigration policy: Theory and evidence from bilateral data. *Regional Science and Urban Economics*, pp. 817–828.
- Dreher, A., & Schneider, F. (2010). Corruption and the Shadow Economy : an empirical analysis. *Public Choice* 144, pp. 215-238.
- Egger, P. (2002). An econometric view on the estimation of gravity models and the calculation of trade potentials. *The World Economy* 25.2, pp. 297-312.
- El-Sakka, M., & R., M. (1999). The macroeconomic determinants of emigrant remittances. *World Development* 27, pp. 1493-1502.
- Faini, R. (1994). Workers Remittances and the Real Exchange Rate: A Quantitative Framework. *Journal of Population Economics*, Vol. 7, No. 2, pp. 235-245.
- Frankel, J. (2011). Are bilateral remittances countercyclical? *Open Economies Review* 22.1 , pp. 1-16.
- Freund, C., & Spatafora, N. (2005, September). Remittances: transaction costs, determinants, and informal flows. *World Bank Policy Research Working Paper* 3704.
- Giuliano, P., & Ruiz-Arranz, M. (2009). Remittances, financial development, and growth. *Journal of Development Economics* 90, no. 1 , pp. 144-152.

- Gupta, P. (2006). Macroeconomic Determinants of Remittances: Evidence from India. *Economic and Political Weekly*, Vol. 41, No. 26, pp. 2769-2775.
- Head, K., & Mayer, T. (2013). *Gravity Equations: Workhorse, Toolkit, and Cookbook*. Center for Economic Policy Research.
- Higgins, M., Hysenbegasi, A., & Ponzo, S. (2004). Exchange-rate uncertainty and workers' remittances. *Applied Financial Economics* 14, pp. 403-411.
- Lueth, E., & Ruiz-Arranz, M. (2008). Determinants of bilateral remittance flows:. *The BE Journal of Macroeconomics* 8, no. 1, pp. 1-23.
- Niimi, Y., Ozden, C., & Schiff, M. (2010). Remittances and the Brain Drain: Skilled Migrants Do Remit Less. *Annals of Economics and Statistics* 97/98, pp. 123-141.
- Pieke, F. N., Hear, N. V., & Lindley, A. (2007). Beyond control? The mechanics and dynamics of 'informal' remittances between Europe and Africa. *Global Networks* 7.3, pp. 348-366.
- Rauch, J. E., & Trinade, V. (2002). Ethnic Chinese Networks in International Trade. *The Review of Economics and Statistics* 84, pp. 116-130.
- Ravallion, M. (2003). Measuring Aggregate Welfare in Developing Countries: How Well Do National Accounts and Surveys Agree? *The Review of Economics and Statistics* 85(3), pp. 645-652.
- Schneider, F. (2005). Shadow economies around the world: what do we really know? . *European Journal of Political Economy* 21.3, pp. 598-642.
- Silva, J. M., & Tenreyro, S. (2005). *The log of gravity*. Centre for Economic Policy Research.
- Sousa, J. d., & Duval, L. (2010). Geographic distance and remittances in Romania: Out of sight, out of mind? *International Economics*, pp. 81-98.
- Wang, Z. K., & Winters, L. A. (1992). The trading potential of Eastern Europe . *Journal of Economic Integration* 7.2, pp. 113-136.