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Macroeconomic and Spatial Determinants of Remittances: A Cross Country Analysis

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Preface

The Centre for Research in Economics and Business (CREB) was established in 2007 to conduct policy-oriented research with a rigorous academic perspective on key development issues facing Pakistan. In addition, CREB (i) facilitates and coordinates research by faculty at the Lahore School of Economics, (ii) hosts visiting international scholars undertaking research on Pakistan, and (iii) administers the Lahore School's postgraduate program leading to the MPhil and PhD degrees.

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Since the second half of 2018 we have had issues with our regular editing services, as a result of which there has been a growing backlog of working papers that had been approved by the editorial committee. To avoid further delays in dissemination of the ongoing research, we decided to publish approved but unedited working papers online. Working paper No 03-18, December 2018 was the first such paper.

Macroeconomic and Spatial determinants of Remittances: A Cross Country Analysis

By

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Abstract

The volume of official world remittances and the rate of international migration have increased since 1970. Using bilateral remittances data from the top fifteen remittance recipient countries from 2010-2014, this study will examine numerous factors affecting remittances. The study uses a variety of panel data techniques to determine the impact of basic spatial variables, network effects, gravity and other macroeconomic variables on the volume of remittances.

By incorporating panel data techniques such as Pooled OLS, Fixed Effects Model, Random Effects Model and Mundlak approach in our study, we can overcome the problems of unobserved heterogeneity and simultaneous bias which exist between remittances and the stock of migrants. The main contribution of the study is that it identifies one of the most crucial factors affecting remittances, i.e., genetic distance. We find that numerous factors have an important impact on the magnitude of remittances such as GDP per capita of the host and home countries, exchange rates, common colony, common language, migrants stock and genetic distance. Geographical and religious distances however do not appear to be significant.

We also prove that the significance of our core variable, genetic distance, is robust to the changes in the specification of the estimation methods and to the changes in the way of quantifying remittances and genetic distance.

List of symbols

OECD- Organization for Economic Co-operation and Development

GDP- Gross Domestic Product

OLS- Ordinary Least Square

FE- Fixed Effect

RE- Random Effect

IV- Instrument Variable

2SLS- Two-Stage Least Squares

F_{st}- Fixation Index

Table of Contents

1. Introduction

People living in one part of the world move to the other due to good economic opportunities or instability in the home countries. The history of migration began with the movement of Homo erectus out of Africa and across Eurasia beginning around one million years ago. Internal and international migrations are forces behind socio-economic development of countries.

There are economic, political and social factors that motivate people to migrate. Of these, economic factors are the most significant. Economic migrants generally originate from developing or under developed countries and are seeking sustainable income. The income these migrants send back home through remittances is an important source for economic development.

Overall from 1950-2015, Europe, North America and Oceania have been the regions receiving the largest number of immigrants. Recent census data shows the stock of international migrants was 247 million in 2013, as compared to the previous estimate of 232 million, and has exceeded to 250 million in 2015 (International Migration Report, 2015).

The time series trend for international migration shows that there is a continuous rise in the rate of international migrants, globally. The highest percentage for the migrants share in the population is 3.2% in 2015 (see Appendix, figure 1).

When we think about the financial flows to a country, we mainly think about foreign direct investments, portfolio investment and official development assistance. However, since the 1990s, remittances sent by the migrants worldwide have been contributing significantly towards the growth of financial inflows of countries. Remittances are domestic income sent from abroad

in the form of cash or in kind. It can be sent through both official and unofficial channels. Banks, money grams and Western Union are some of the formal ways of sending remittances. Informal channels include individuals bringing cash personally when traveling home, as it is not officially recorded.

Global remittance receipts by both developing and high-income countries have risen to $586 billion by the end of 2015. Remittances to developing countries are estimated at $404 billion in 2013, which shows an increase of 3.5 percent from 2012. Remittances flow continued to rise by 4.4 percent in 2014. This growth rate slowed down in 2015 as remittances were expected to rise only by a moderate rate of 0.9 percent (Migration and Development Brief, 2015). The main reasons behind this slowdown were strengthening of the US dollar, tight financial security controls on remittances in many source countries and impact of reduced oil prices on the Russian economy.

Remittance streams are expected to recover in 2016 to reach $479 billion by 2017, consistent with the more positive global economic situation. This projection is based on the world's GDP, bilateral migrant stock and historical trends of the remittances. The main driver behind the growth in remittances is the expansion of incomes in the destination countries and exchange rate movements.

As net senders of remittances from 2000-2010, OECD countries are the leaders of the world. Compared to non-OECD countries, OECD countries contribute 28 percent of the total world remittances followed by Europe and Central Asian regions (20 percent) (see Appendix, figure 2).

As net receivers of remittances, low and middle-income countries including Afghanistan, China and Egypt are the major recipients (30 percent), followed by lower middle-income countries like Bangladesh and India (18 percent) (see Appendix, figure 3). Individual countries data shows that India is the major recipient of remittances followed by China and Mexico (see Appendix, figure 4).

Remittances are one of the main components of foreign exchange income for developing nations. It has helped reduce pressure on the domestic labor market as shown by a micro study on Mexico, where researchers found that remittances help in loosening the budget constraint which is likely to reduce the hours worked by the individuals receiving remittances and women's participation in the labor force (Dorantes and Pozo, 2006).

Remittances stimulate higher growth rates and have relatively stronger impact on savings for poorer countries. It tends to build up physical capital through positive effect on savings (Ziesemer, 2006). Good economic prospects, improved investment and human capital growth are some of the benefits received by remittance recipient countries. [Calaro (2008); Jongwanich (2007); Stark and Lucas (1988); Taylor (1992); Faini (2002); Gupta et al. (2009)].

In analyzing the impact of remittances on consumption patterns of the migrant and non-migrant households, a study found that monthly total expenditure of migrant households (per capita) is 50 percent higher than the non-migrant households (Perakis, 2011). Remittances are an important source of financial development as they are positively correlated with deposits and credit. Their counter cyclical nature makes them the second largest source of external revenue for developing countries (Ziesemer, 2006).

On the other hand, remittances can also adversely impact the economic growth of a country due to moral hazard. This is because remitters don't know the intentions of the recipients. As a result, recipients might lower their work effort which tends to reduce the economic activity in a country (Chami, Fullenkamp and Jahjah, 2003). In a study analyzing the impact of remittances on institutional growth, the researchers found remittances to be negatively related to the indices of the corruption control, government efficiency and the rule of law. This is because remittances can increase the funds diverted to the government for their own use (Abdih, Chami, Dagher, and Montiel, 2008). Furthermore, remittances might have a Dutch disease effect as they are positively correlated with the real exchange rate appreciation (Chami, Barajas, Cosimano, Fullenkamp, Gapen, and Montiel, 2008).

Despite some of the negative impacts of remittances, increasing globalization and improved technology have made remittances an important source of income at micro level and a significant source of economic growth. Therefore, a study based on factors affecting remittances will contribute to the existing literature by highlighting some of the new determinants of remittances.

This paper tries to answer the question of whether spatial variables like genetic and geographical distances have a significant impact on the magnitude of remittances. In addition to this, the study will try to highlight the influence of network effects, such as religious distance and migrants stock, on remittances. Existing literature shows that geographical distance, common border, common language and network effects can have a significant impact on the probability to remit (Zarzoso and Ahmed, 2014; Borjas, 2000). Also, the presence of ethnic networks can reduce transaction costs through immigration networks (Rauch and Trindade, 2002; Rauch and Casella, 1998; Rauch, 2001; and Gould, 1994).

The present literature talks about various macro and micro economic factors affecting remittances, but the analysis is limited in highlighting the importance of genetic distance as a significant determinant. Genetic distance captures the divergence in characteristics transmitted across generations within the population over an extended period.

This paper makes some important contributions. Firstly, it will try to unbundle the correlation between genetic distance and the amount of remittances. The recent trend of the international migration rate shows that it might continue to rise in the years ahead, indicating that remittances from abroad will continue to contribute significantly towards the foreign exchange, making it important to analyze factors affecting remittances. This study will identify several other important determinants driving remittances and determine whether genetic distance is a significant driver of remittances.

Intuitively, genetic distance seems to be a key factor affecting the magnitude of remittances as genetically closer countries, which share common characteristics, have a higher probability to remit to each other. Later in the study, the literature will highlight how genetic distance reflects cultural and linguistic roots and trust between two populations. Therefore, genetically closer countries with common cultural roots and greater mutual trust will tend to remit more to each other. Although genetic distance is a crucial factor for an individual's motivation to remit, there is limited literature available that analyze this key relationship.

To assess the impact of genetic distance on remittances, the study will use two different measures of genetic distance which are Nei's and Cavalli-Sforza's distances. Nei measures the divergence in characteristics by the process of amino acid substitution. Whereas Cavalli-Sforza (1995) used similar allele frequencies to construct a bilateral co-ancestor coefficient to measure

the genetic distance. By integrating these measures, the study will try to find if both measures will have a significant impact on remittances. In addition to this, by incorporating several network effects like religious distance and gravity variables like common language and colony, the study will try to assess whether these factors make a difference towards the magnitude of remittances.

Moreover, the study tries to combine various recent datasets related to religion, language, networks of emigrants and genetic distance to make a unique contribution in this field and present a recent picture of the factors affecting the magnitude of remittances for various countries.

This study is important from the perspective of both developed and developing economies because, to the best of my knowledge and research, there are almost no studies mentioning the relationship between genetic distance and remittances. Macro panel analysis of the economies in the study will determine the crucial factors driving remittances in the respective countries. This will provide an important comparison of several factors affecting the remittances flows to various countries.

In what follows, section II will discuss literature on the determinants of remittances, section III will provide the methodology the study will follow, section IV, V and VI will describe the data employed and the methodology used, followed by section VII which discusses the empirical results. Lastly, section VIII and IX will show the robustness tests and draw conclusions respectively.

2. Literature Review

This section will discuss the literature on various determinants of remittances and demonstrate that almost all the studies referenced are missing a key factor which can impact remittances, i.e., genetic distance. Many studies have so far analyzed the determinants of remittances using both macro- and micro-level data sets. Under this section, the study will first discuss the macroeconomic, gravity and spatial variables and network effects that affect the volume of remittances. Later, it will highlight the demographic and micro-level variables impacting remittances.

The economic situation of both host and recipient countries is one of the most important determinants of the flow of remittances. Numerous studies on Latin America and India found that remittances are more receptive to the economic situation in the source country than the recipient country (Vargas-Silva and Huang, 2006; Singala and Allamraju, 2011). Additionally, Buch and Kuckulenz (2004) found that growth in economic activity have an ambiguous impact on the magnitude of remittances.

Considering the individual macroeconomic determinants, studies found that the recipient country's output, i.e., GDP, is negatively associated with the flow of remittances. This association was confirmed by the study done on thirty-six Sub-Saharan African countries from 1990-2005 (Singh et.al, 2011). The flow of remittances to Turkey was negatively impacted by Turkey's income level (home country) and positively affected by the income level in the host country (Aydas, Neyapti and Ozcan, 2005). In a study concerning Bangladesh, its GDP had a positive and significant impact on the flow of remittances. Due to increased employment and earning prospects in the recipient countries, migrants are willing to send more remittances

(Sarkar and Datta, 2014). A study concerning India found GDP to be an insignificant determinant for remittances (Singala and Allamraju, 2011).

Another macroeconomic indicator that plays a key role is the exchange rate of both the source and recipient country. The relationship between these two variables is ambiguous. If the migrant country's currency appreciates, then based on the theory of altruism and the case of Sri Lanka, a migrant would reduce remittances as the same amount of goods in the recipient country can be bought by less currency of the source country (Lueth and Arranz, 2007).

Conversely, an appreciation of the migrant's currency against the recipient country's currency can potentially increase the value of remittances in the recipient country, if the migrant doesn't change the amount of remittance in their domestic currency (Lueth and Arranz, 2008). This was confirmed by a study done in Philippines and Bangladesh (Yang, 2008; Sarkar and Datta, 2014). In India's case, bilateral exchange rates didn't significantly impact remittances (Singala and Allamraju, 2011).

Similarly, interest rate differentials between source and recipient countries play a significant role as well (El-Sakka and Mcnabb, 1999). The results from the study on Pakistan in exploring the impact of interest rate differentials on remittances confirms the outcomes, that the interest rate differential is an important driver of remittance flows (Freund and Spatafora, 2005). Katseli and Glytsos (1986) proved remittances to be negatively associated with the source country's interest rate, and Hasan (2008) found remittances to be positively linked to the recipient country's interest rate. Contrary to this, a Turkish study showed an ambiguous effect of interest rates on worker's remittances. There are two possible explanations for this: while high

interest rates encourage immigrants to invest, they are also an indicator of inflation in the country.

Inflation rate is another important indicator of the volume of remittances. Aydas, Neyapti and Ozcan (2005) demonstrated a significant impact of inflation on Turkish remittances. According to a study by Katseli and Glytsos (1986), the recipient country's inflation rate is negatively related to remittances because migrants would remit later to avoid the inflationary effect. On the other hand, high inflation in the home country causes remittances to rise to compensate for the fall in purchasing power in the home country. However, the evidence on the influence of inflation on remittances is mixed. Buch and Kuckulenz (2004) found that the impact is indecisive.

Likewise, other macroeconomic indicators affecting remittances include black market premium, financial institutions, political stability and consistency in government's policies. The relationship between black market premium and the magnitude of remittances were found to be negative for Egypt, Turkey, North Africa and Southern Europe. As the difference between the official rate of exchange and the black-market exchange rate increases, migrants would switch to the unofficial ways of sending remittances. (The studies only cover the remittances sent through official channels: Mcnabb, 1999; Aydas, Neyapt and Ozcan, 2005; Elbadawi and Rocha, 1992).

Financial sector development, another factor affecting remittances, can be estimated by calculating domestic credit to the private sectors as a percentage of GDP. Countries with higher financial sector development reduce the transaction costs, making it easier and cheaper to send remittances through official channels (Freund and Spatafora, 2005; Singh et al., 2011).

Moving on to political instability as a factor affecting remittances, researchers found that this variable negatively impacted the inflow of remittances into Turkey (Straubhaar, 1986). The nature of government is another factor affecting worker's remittances, as supported by a study done in Turkey, where remittances fell during the military regime and stabilized later (Aydas, Neyapti and Ozcan, 2005). Geopolitical events have affected remittances as well, specifically in the case of Pakistan, where because of the September 11, 2001 terror attacks, United States and other Western countries increased scrutiny of Pakistani nationals' financial records (Kock and Sun, 2011).

Furthermore, the total number of migrants and the real wages of workers in the source country were found to have a positively significant effect on the magnitude of remittances (Swamy, 1981; Straubhaar, 1986; Elbadawi and Rocha, 1992; El-Sakka and Mcnabb, 1999; Chami, Fullenkamp and Jahjah, 2005). In North Africa, Elbadawi and Rocha (1992) found the impact of the quantity of migrant workers on remittances to be positive, whereas it wasn't significant for Turkey (Aydas, Neyapti and Ozcan, 2005).

In addition, unemployment is an important driver of remittances. Numerous studies prove unemployment in the source country to be negatively related to its remittances (Sultonov, 2011).

The cost of sending remittances is another drain to the migrants sending income to their home country. Lower costs accompanied with greater geographical distances tend to increase remittances (Schiopu and Siegfried, 2006). Countries that are less competitive in the market for remittances tend to have a higher cost for sending remittances. As a result, many migrants switch to informal channels of remittances, such as the physical carrying of cash by the migrant's family or friends or the migrant himself.

Remittances are counter cyclical or shock absorbing for an economy, as in the case of Philippine and Sri Lankan households, where remittances increased after fiscal crises and oil shocks (Yang, 2008; Leuth and Arranz, 2007). Other perspectives show that remittances can help generate output, consumption and investment as migrants tend to invest their savings in small markets in the recipient country and support local markets (Giuliano and Ruiz-Arranz, 2005). Another very important motive involved behind sending remittances is investment. This motive is reinforced if there are favorable market conditions in the home country.

The occurrence of a natural disaster can also be a reason for a rise in remittances. Yang (2008) and Ebeke and Combes (2013) found a significant increase in the amount of remittances in the recipient country after the occurrence of a natural disaster and deterioration in the terms of trade.

Some of the demographic characteristics, like ratio of female employment or high age dependency ratio in the source country, can negatively impact the flow of remittances. On the other hand, the source country's illiteracy rate has a positive impact on the remittance flow (Buch and Kuckulenz, 2004).

Most importantly, the study describes the key factor affecting the immigrant's behavior regarding remitting, i.e., distance. Distance can be categorized as genetic, cultural and geographical. An immigrant's social network in the host country can affect their remitting behavior. To explore the effect of social norms on the individual's behavior to remit, studies have been assessing the impact of cultural distance on the probability to remit.

Studies have quantified cultural distance by measuring the degree of relatedness amongst two populations through genes, language, colonial origin and religion (Spolaore and Wacziarg,

2009; Dyen, Kruskal and Black, 1992; Mecham, Fearon and Laitin, 2006). Literature has shown the impact of these variables on various economic outcomes like growth and trade. And to the best of my knowledge no study incorporates spatial, gravity and macroeconomic variables together to assess their impact on remittances. This study will mainly focus on the relationship between genetic distance and the probability to remit.

Studies have examined the relationship between genetic distance and economic development but there are almost no studies highlighting the relationship between genetic distance and the magnitude of remittances.

Many studies have used the Cavalli-Sforza, Menozzi, and Piazza (1994) approach to assess the effects of genetic distance on different variables of interest. Populations sharing more recent common ancestry take less time to diverge, which helps them to adapt innovation and complex technology quickly (Spolaore and Wacziarg, 2009). In a study, genetic distance between the two populations reflected linguistic and cultural roots (Ammerman and Cavalli-Sforza, 1985). Genetically close countries trust each other more. As a result, there is a high rate of technology transfer (Spolaore and Wacziarg, 2009). Giuliano, Spilimbergo, and Tonon (2006) claim that genetic distance is just a proxy for transportation costs. Using this proxy, the authors found transportation cost to be insignificant in affecting variable trade. Similarly, it was used as an instrument for trust but failed to affect economic activity (Guiso, Sapienza, and Zingales, 2006). Another study showed that more trust between any two genetically same countries, irrespective of their geographical distance, will have higher growth spillovers (Chaudhry & Ikram, 2015).

Genetic distance is a significant variable in explaining the income levels of a country. Genetic distance is also able to capture human barriers to the diffusion in development. These barriers include historically rooted differences, like mistrust and racial and ethnic biases. This study regressed bilateral distance on the log of differences in the income of the two countries. The bilateral genetic distance was a significant factor in explaining the differences in income as long as the genetic distance relative to the technological frontier (i.e., United States, in the study) was measured and included in the regression (Spolaore and Wacziarg, 2009).

Desmet et al (2007), in his study on European countries, showed that populations of the countries which are genetically alike have similar views on cultural and moral issues. A few studies have used genetic distance as a proxy and instrument for culture (Spolaore and Wacziarg, 2006; Guiso, Sapienza, and Zingales, 2006). Spolaore and Wacziarg interpret the Cavalli-Sforza's index as a measure of "vertically transmitted characteristics," reflecting a set of characteristics passed over generations within a population over time, which shows that genetic distance is strongly associated with bilateral differences in per capita income. Moreover, Gorodnichenko and Roland (2010) used genetic variation as an instrument for culture and found that individualism leads to more innovation.

In contrast to many studies which highlight the importance of genetic distance in affecting economic outcomes, Giuliano et al. (2006) found that genetic distance is no more important once geographical factors are controlled for.

At the micro level for the allocation of food, clothing and remittances, migrants tend to favor those with whom they are genetically close (Posel and Bowles, 2005).

Based on the cultural and ethnic similarities, the literature highlights how social and cultural networks can impact interaction between individuals from within and outside the countries. These networks tend to overcome the informal barriers to international trade by reducing transaction costs through migrants' networks (Rauch and Trindade, 2002; Rauch and Casella, 1998; Rauch, 2001; and Gould, 1994). West and Graham (2004) assessed the impact of cultural distance on managerial values. They measured linguistic distance between 51 countries and the English language by using a family tree of 6500 languages to form hierarchy of languages, then calculating linguistic distance from English. A different study uses this data to assess the connection between genetic and linguistic distances and shows a significant positive relationship between the two (Chaudhry and Ikram, 2015).

Similarly, religious distance measured using the Mecham, Fearon, and Laitin (2006) approach shows that it is not strongly correlated with genetic distance. Moreover, the results of the study showed that religious distance is not an important barrier to diffusion of economic development (Spolaore and Wacziarg, 2009).

Studies have tried to quantify cultural distance in diverse ways and only a few have focused on the impact of this distance on remittances. In a study, social links among individuals in a neighborhood were represented using language spoken at home. Evidence recommended that people in the United States who do not speak English interact more with those who speak their language of origin. Therefore, individuals with similar linguistic culture will have a larger pool of contacts (Bertrand, Luttmer and Mullainathan, 2000). In Pakistan, common language had a significant positive impact on the amount of remittances (Zarzoso and Ahmed, 2014). A gravity model on the developing economies showed common colonial origin to significantly affect the probability to remit (Lueth and Arranz, 2008).

In another study, network effects were captured using a dummy variable that equaled one if the household has social networks in the host country, and zero otherwise. This network effect is used in quantifying the community variable used in the study for Modalva (Piracha and Saraogi, 2011). The results of the study show that community variables and presence of networks at home have a significant effect on the probability to remit. Common characteristics amongst the individuals living together in the same region can reinforce remitting behavior. Moreover, due to self-selection, individuals with the same ethnic backgrounds are living in the same territories. This means there is a positive correlation between remittances and immigrants from the same country of origin (Borjas, 2000).

In addition to this, a paper by Aparicio (2011) explored the existence of network effects in remittances behavior. The network effects in this study are defined as groups of immigrants from the same country that live in the same locality in the host country. Using a database for Spain, networks are shown to have a positive impact on the probability of remitting as well as on the quantity remitted. This is consistent with the fact that an immigrant faces social pressure to remit as part of their ethnic social network, and he or she would be informed of saving or investment opportunities in their home country, as well as funds remittance channels.

Immigrants with the same cultural backgrounds living in the same area tend to remit more because of better transfer services, social pressure and ties with the community of origin. A study on Mexican migrants in the United States showed that the migrants tend to remit more if they found work through social links and if they have more members from their origin community (Massey and Basem's, 1992). However, this might not always be the case as a study by Clark and Drinkwater (2007) showed that remittances from the United Kingdom had a significantly negative relationship with the percentage of co-ethnics in that area.

Similarly, immigrants are likely to change their behavior through network effects. Being part of the social network in the host country could help the immigrant find employment for their family in the home country. This mitigates the family's exposure to the risk of low income, thereby reducing the immigrant's incentive to remit. This can be categorized as in direct effect on the remittances (Amuedo-Dorantes and Pozo, 2006).

Other studies have frequently mentioned geographical distance between the host and home countries as one of the factors affecting remittances. Geographical distance can also be stated as the distance between the migrant and his or her family or home country. Distance can cause remittances to either fall or rise. In the case where remittances contain an altruism component, immigrants tend to send less remittances to the family with increasing distance (Rapoport and Docquier, 2006). Moreover, if the country of origin and the donor countries are far away, the enforcement of family contracts agreed upon before immigration might decrease, reducing the flow of remittances (Rapoport and Docquier, 2006).

If transfer costs are a proxy for geographical distance, then remittances tend to decrease with increasing costs (Lueth and Ruiz-Arranz, 2008; Frankel, 2009). Similarly, Frankel (2011), using the data sets from Lueth and Arranz (2008), found remittances to be inversely related to the distance.

On the other hand, the magnitude of remittances tends to increase with the increasing distance. This can be explained in two ways. Firstly, if we consider the remittances sent through official channels like banks or money transfer companies, then the flow of remittances would rise as the migrant would visit the home country less frequently. Secondly, there are direct costs involved with the process of emigration like transportation costs or the legal procedure to acquire

a visa. All these costs would discourage the migrant to visit the home country. As a result, remittances would increase with greater distance between the sending and recipient countries. (Sousa and Duval, 2010)

A recent study in Romania by Sousa and Duval (2010) tried to capture the effect of geographical distance on remittances sent to Romania by OECD countries from 2005-2009. The study found the relationship between distance and magnitude of remittances to be positively significant. Also, distance has a diminishing effect on the remittances. Contrary to this, a study by Docquier, Rapoport and Salomone (2011) showed the negative impact of geographical distance on remittances.

In Pakistan, geographical distance was set as a proxy for transaction cost. The results showed that distance is not a key factor in driving remittances. There were two reasons stated in the study. Firstly, the cost of sending money is unrelated to the geographical distance. And secondly, distance being the same, the costs involved with transferring money from developed to developing countries is higher than the cost of sending in the opposite direction. As a result, cost of money transfers is more related to financial sector development than the geographical distance (Ahmed and Zarzoso, 2014).

Microeconomic studies which address migrants' motives have considered altruism to be one of the most important motives behind remittances. Migrants tend to send money to support their family in the home country (Bilgrami and Nishat, 1993).

The opposite of altruism, i.e., self-interest, is another motive that drives the flow of remittances in the following ways. Firstly, the migrant might be sending remittances to repay a loan if the migrant's family has invested in their migration process or the migrant's education.

Conversely, if a migrant makes sufficient investments in property in their home country, then the remittances may decline (Bilgrami and Nishat, 1993).

Migration can be used as a tool to smoothen the income cycle by reducing risks (Stark, 1984). By sending a member of the family abroad, the household's income can be diversified. Hence, remittances can be considered as an insurance that guards the family of the migrant in the absence of an effective insurance market in the home country. According to a study by Dorantes and Susan Pozo (2011) on Mexican household data, remittances were a source of stabilizing income streams, especially for developing economies.

Another very strong microeconomic factor that drives remittance is exchange motive. It involves a migrant's self-interest. The migrant would tend to send remittances back home in return for services provided to take care of the migrant's children or his financial assets (Poirine, 1997). Hoddinott (1994) describes an additional self-interest motive, which is the share in inheritance. The migrant would tend to uphold strong ties with the family back home by sending remittances if there is a share for him or her in the property of the family.

Some of the demographic factors thought to be associated with remittances include gender, marital status, legal status of the sender, skill level and family arrangements.

A study found that if the donor is a woman then the mean amount of remittances will be low, as husbands are not generally dependent on their wives' income for support (Orozco, Lowell and Schneider, 2006). Other studies found women to remit more due to their relatively strong ties with their families (Richter and Havanon, 1995 and Tacoli, 1999). The marital status of an immigrant shows his or her links to the family back home. Therefore, an altruistic individual will send more remittances if he or she has a spouse or children.

The legal status of an immigrant can also impact the flow of remittances. An undocumented immigrant tends to send more money to his family as this would increase his ability to establish a good base in the country of origin. Additionally, the skill level or the educational background of an individual affects the magnitude of remittances as well. A highly skilled worker tends to remit less, as he or she is more likely to secure employment in the host country and plans to immigrate additional family members (Schiopu and Siegfried, 2006).

Differences in family settings or arrangements and the nature of families can affect a migrant's behavior. In traditional patriarchal family structures, where males are dominant, the magnitude of remittances tend to be high. Whereas in families where unhealthy relations persist and male attachment is low, the flow of remittances might be low as well. This was confirmed by a study done by Sana and Massey (2005) that showed that flow of remittances in Mexico is higher than that of Dominican Republic as Mexico follows a more tradition patriarchal family structure.

Literature has so far identified the macro, micro and some of the gravity variables affecting the magnitude of remittance. Various spatial variables were used in the studies to assess their impact on growth rates. The analysis shows a strong link between genetic distance and cultural and linguistic distance and mutual trade between countries (Chaudhry and Ikram, 2015).

Other studies have highlighted macroeconomic indicators like GDP of the sending and recipient countries, exchange rates, unemployment rate, rate of inflation and interest rate differentials as main factors affecting remittances (Singh et.al, 2011; Lueth and Arranz, 2007; El-Sakka and Mcnabb, 1999). In addition, literature also identifies important micro-level variables, such as exchange and altruism motives, gender, and skill level, and how they affect the

magnitude of remittances (Bilgrami and Nishat, 1993; Orozco, Lowell and Schneider, 2006; Kock and Sun, 2011).

This paper tries to build on the existing literature by extending the work of Panda & Trivedi (2015) and Ahmed & Zarzoso (2014). This study adds onto the workings of these studies by doing a macro panel analysis of various countries. Moreover, it includes other independent variables, like genetic and religious distance, and gravity variables.

3. Defining and measuring Genetic Distance

This section mainly defines genetic distance and discusses two different approaches of measuring genetic distance.

3.1 What is Genetic Distance?

Genetic distance captures the divergence in characteristics transmitted across generations within the population over an extended period. It tries to measure the degree of relatedness between individuals or cross-country populations. Genetic distance occurs overtime, and measures the time passed since two populations shared common dynasties. Thus, it can be considered a general metric for average differences in characteristics transmitted across generations. Genetic distance doesn't measure the difference in specific genetic traits as it is based on a neutral change.

To assess the impact of genetic distance on remittances, the study will use two different means of genetic distance which are Nei's and Cavalli-Sforza's distances. Nei measures the divergence in characteristics by the process of amino acid substitution. He defined the

normalized identity of genes between populations which is equivalent to the proteins identity. The other measure uses allele—the basic unit of the study—used to construct unit frequencies that represent the share of population with a specific form of gene. Cavalli-Sforza (1995) used similar allele frequencies to construct bilateral co-ancestor coefficients for a set of 42 populations around the world. This study uses a similar co-ancestor coefficient, F_{st} distance, which is the possibility that two randomly selected genes belong to the same group of persons. If two groups of people are the same, it takes a value "0", otherwise it takes a value "1". A zero value is indicative of no genetic diversity between two selected groups of populations whereas a value of "1" indicates close genetic diversity between the two populations.

Many studies have used the Cavalli-Sforza, Menozzi, and Piazza (1994) approach to assess the effects of genetic distance on different variables of interest. Populations sharing more recent common ancestry take less time to diverge, which helps them to adapt innovation and complex technology quickly (Spolaore and Wacziarg, 2009).

Cavalli-Sforza's index was interpreted as a measure of "vertically transmitted characteristics," reflecting a set of characteristics passed over generations within a population over time (Spolaore and Wacziarg, 2009).

Figure 1 below shows the F_{st} index calculated by Cavalli-Sforza for the populations included in our analysis. The value of the index ranges from 0 to 1. For example, it's 0.0476 for Brazil and France, which shows some genetic diversity between populations of the two countries, whereas a value of 0 between Belgium and Canada depicts no genetic diversity between the two populations.

Figure 1: Fixation Index

Country 1	Country 2	fst_distance
Belgium	Canada	0
Brazil	France	0.0476
China	Netherlands	0.0476
Egypt	France	0.0042
El Salvador	Germany	0.1266
France	Canada	0
Germany	France	0.0021
Guatemala	U.S.A	0.1246
India	U. K	0.028
Mexico	U.S.A	0.1246
Nigeria	Germany	0.1459
Pakistan	Canada	0.028
Philippines	France	0.1117
Turkey	Germany	0.082

4. Hypothesis

Hypothesis 1: Remittances to recipient countries are negatively related to genetic distance between the two countries.

Hypothesis 2: Remittances to recipient countries are positively linked to the gravity variables and network effects.

Hypothesis 3: Remittances to recipient countries are positively related to the external value of the local currencies of these countries, i.e., if the local currency of a recipient country appreciates (depreciates) against US $, it is projected to have a positive (negative) effect on remittances to that country in US $ terms.

5. Data

The data used for empirical analysis is secondary. It is collected for five years from 2010-2014 for the top fifteen countries by remittances received. The data is sourced from major websites, including: CEP II, The World Bank, Bureau of Emigration and Overseas Employment, The International Disaster Database and Worldwide Governance Indicators, Robert Barro (Harvard University) and American Economic Association, Laborsta and OECD database.[1]

The secondary data employed in the study is mainly extracted from authentic websites, making the data very useful. As the secondary data is from recent years, the study will highlight the current trends in remittances and some of the more recent factors that have been affecting the magnitude of remittances.

The limitations on available data is that they underestimate the value of bilateral remittances sent through unofficial channels. The period 2010-2014 was chosen in view that the necessary data was incomplete for many countries prior to 2010. For example, data on bilateral remittances and migrants for some countries is missing prior to 2010.[2]

This research study is an extension of the works of Panda & Trivedi (2015) and Ahmed & Zarzoso (2014). As a result, most of the variables part of this study are based on the works of these authors. The study is unique in a sense that it fills the gap in the literature by adding two variables, i.e., religious and genetic distance.

[1] Detailed description of all the variables is given in Table 1 (see Appendix).

[2] The missing values in case of a few variables have been handled by the complete case analysis (Jonathan Bartlett, 2013). Lack of availability of data on migrant's stock and religious distance doesn't cause any bias in the estimated results as proven by Little's MCAR (Missing Completely at Random) test, where a higher p-value of 0.5467 and 0.9801 show that the missing values are missing completely at random. Therefore, complete case analysis gives unbiased estimates.

One of the foremost ideas of the study is to analyze the link between genetic distance and remittances. To measure genetic distance, allele—the basic unit of the study—is used to construct unit frequencies that represent the share of population with a specific form of gene. Another measure of genetic distance is Nei's genetic distance.

Various spatial measures such as geographical and genetic distances have been incorporated in the study. Moreover, several gravity and macro level variables are part of the study as well. Table 1 provides the descriptive stats of the variables employed in the study.

Table 1: Descriptive Statistics

Variables	Observations	Mean	Std. Dev.	Min	Max
Dependent					
Remittances (million dollars)	750	1612.897	3103.097	1.373456	24395.54
Remittances per capita	750	.1219661	.473171	.0000735	4.735237
Remittances per migrant	300	.0063734	.0075326	.0000542	.0638201
Spatial					
Genetic Distance(F_{st})	750	481.9533	534.0051	0	1794
Genetic Distance(Nei)	750	82.92	92.93325	0	359
Genetic Distance (Weighted)	745	535.0244	382.1551	1.934959	1443.525
Geographical Distance	750	4972.596	4162.606	173.0333	17693.2
Gravity					
Common Language	750	.3533333	.4783241	0	1
Common Colony	750	.0533333	.2248473	0	1
Network Effects					
Migrants Stock	300	374619.2	1087723	857	13000000

Religious Distance	670	.482897	.431847	0	1
Other Macro					
GDP/capita (Recipient)	750	13183.27	16038.98	1024.589	47801.6
GDP/capita (Sender)	750	36975.79	21846.54	596.0906	113731.6
Inflation (Recipient)	750	5.23822	3.552548	.3391667	13.88114
Exchange Rate	746	65.04234	382.897	.2759789	4735.462

6. Methodology

We begin with a simple model using Ordinary Least Square to study the impact of genetic distance on the magnitude of remittances. Later in the study we will use techniques for panel data estimators like fixed and random effects and the Mundlak approach. An effective way of interpreting the results will be to use logs for all the explanatory variables and the dependent variables. As a result, the coefficients will represent the elasticities for the respective variables.

6.1 Main Specification and Description of the Variables

$$REM_{it=}\,\beta_0 + \Sigma\beta_1 W_i + \Sigma\beta_2 X_{it} + \Sigma\beta_3 Y_i + \beta_4 Z_{it} + \varepsilon_i$$

Where *i* and *t* indicate the remittance-sending country and time, respectively. The dependent variable $\text{Remittances}_{it\ is}$ the value of bilateral remittance flows from the sending country to the receiving countries from 2010 to 2014. The three different dependent variables are cash remittances in millions of dollars, remittances per capita and remittances per migrant. β_1 consists of spatial variables like genetic and geographical distances, β_2 includes all the gravity variables like common language and common colony, β_3 consists of network effects measured

through migrants' stock and religious distance and β_4 comprises of all other country specific characteristics like GDP per capita, exchange rate and inflation.

Remittances per capita is a useful measure for comparison among countries because it shows the relative performance of the countries. It demonstrates the average economic impact, relevant for our analysis. Remittances per migrant as a dependent variable is an indirect indicator of the migrant's employment type. It is a crude indicator of migrant's financial situation. By changing the dependent variables, we will be able to prove our hypothesis in three separate ways, i.e., genetic distance is negatively affecting remittances.

The main explanatory variable is genetic distance. To measure genetic distance, the allele— the basic unit of the study—is used to construct unit frequencies that represent the share of population with a specific form of gene.

This study uses the similar co-ancestor coefficient as constructed by Cavalli-Sforza (1995), regarded as F_{st} distance. It is the likelihood that two randomly selected genes belong to the same group of persons. If two groups of people are the same it takes a value of "0", otherwise it takes a value of "1".

The country specific characteristics can be divided into spatial, gravity and macro variables. Spatial variables include genetic and geographical distances. Similarly, gravity variables incorporated in the study include common colony and common official language. Network effects include religious distance and stock of migrants Lastly, other macro variables include GDP per capita, inflation and exchange rate.[3]

[3] Detailed descriptions of these variables and the ways they are measured are given in Table 1 (see Appendix).

ε_{2it} is the variable error term that denotes the unobservable factors affecting the dependent variables.

6.2 Specification Issues and Solutions

A variety of empirical techniques will be used in the paper. The model will first be estimated using pooled OLS. However, the results will be biased due to correlation between the explanatory variables and individual fixed effects. The possibility of correlation between the error term and explanatory variables exists due to the problem of omitted variables, selection bias and reverse causality. Following are the issues and their respective solutions which we have implemented in this paper:

Sample selection bias

The data used for estimating bilateral remittances are sourced from official channels, as informal channels are missing for some countries. As a result, sample selection bias occurs due to the data only accounting for remittances from formal channels. Country specific characteristics can also bias the results. Omission to control for travel time and transportation infrastructures, which can impact distance and ultimately the magnitude of remittances, can cause sample selection bias. The probability to remit through informal means is another unobserved factor that can bias the results for distance and remittances.

To account for these problems, we will use fixed or random effects. With the assumption of sending country specific effects being uncorrelated with the explanatory variables, we will use the random effects model estimated with Generalize Least Square. However, it makes little sense to account for this assumption, as country specific effects might be correlated with the

explanatory variables, rendering the estimator inconsistent. We then applied the fixed effect model which allows an arbitrary correlation between country specific effects and independent variables.

One of the limitations of FE estimator is its inability to estimate the coefficient of the variables: genetic and geographic distances, which are time-invariant. To overcome this problem, we will consider a random effect model, i.e., Mundlak's (1978) approach to estimating panel data (Susan and Duval, 2010). This approach is a means of relaxing the assumption in the random effect model that no correlation exists between explanatory and unobserved variables.

The Mundlak's approach theorizes that the sending country specific effects can be projected upon the group means of the time-varying variables. Therefore, adding to the equation the means of the time-varying variables (i.e., GDP per capita, exchange rate and inflation, etc.) tries to capture the correlation between the country effects and the explanatory variables. After including the means of these variables as an explanatory variable, the model would be run as a probit random effect. This will cause the RE model to provide consistent estimators and help capture the effect of time constant variables accurately.

Choosing between OLS or Random Effects and Fixed Effects or Random Effects?

To choose among the pooled OLS and random effects model, we will use the Breuch Pagan (1980) LM test (Christopher, 2006; see Appendix). The null hypothesis under this test is that the variance of time invariant part of the error term is zero. Rejecting this hypothesis means that the random effects model is giving better results. Results of this test in our study rejects the null hypothesis (see Breuch Pagan test in the Appendix). Therefore, the random effect model is better than OLS. Lastly, we will use the Hausman test to choose between the random or fixed

effects model. The null hypothesis in this test is that the preferred model is random effects (Greene, 2002). The test checks if the error term is associated with the regressors; the null hypothesis being that they are not. Rejecting the null hypothesis implies that the fixed effects model is appropriate.

Heteroscedasticity

The correlation between individual effects and the error term will cause the model to suffer from heteroscedasticity as the error term won't have a constant variance. In order to detect heteroscedasticity, we use White's General Test (see Appendix) which is a special form of Breusch-Pagan test. A large chi-square value and a p-value closer to zero rejects the null hypothesis, implying the presence of heteroscedasticity. One of the ways to deal with this problem is to use robust standard errors. Robust standard errors relax the assumptions of identically distributed and independent errors. They do not affect the coefficient estimate but just the p-values, making them more significant. Another way to overcome this problem is to transform the variables by taking logs.

Endogeneity

Endogeneity, which is caused by the reverse causality between remittances and stock of migrants is another problem in the model (Ahmed and Zarzoso, 2014). To alleviate this problem, we will use fixed effect two stage least square (FE 2SLS), which incorporates instrument variables. Some of the possible instruments that will be used in the study are the first and second lags of the migrants' stock (Woodruff and Zenteno, 2007).

The method for the 2SLS will be as follows:

First stage

$$MIGRANTSTOCK_i = \alpha_0 + \alpha_1 \boldsymbol{IV_i} + \sum \alpha_n Y_n + \varepsilon_1$$

Second stage

$$REMITTANCES_i = \beta_0 + \beta_1 \overline{MIGRANTSTOCK}_i + \sum \beta_n Y_n + \varepsilon_2$$

Instrument Exogeneity

We will be using more than one instrument in this paper. To test if any instrument is not exogenous, we will apply the Sargan test. This will test the null hypothesis that all the instrument variables are valid. Rejecting this hypothesis would mean that at least one of the instrument variables is not exogenous.

Correlation

Due to the nature of data, there are high chances of interdependence among the variables. To detect this interdependence, we will look for simple inter correlation between the explanatory variables (see Appendix, Table 2). For autocorrelation, which is the correlation between a variable and itself at a different point in time, we will be using the Wooldridge test. This test has been conducted under the null hypothesis that there is no auto correlation against the alternate hypothesis of the existence of auto correlation. A lower p-value shows the null hypothesis being rejected. The test for this study shows the presence of autocorrelation (see Appendix).

To overcome the problems related to autocorrelation, we will add variables to our data. In addition to this, we will re-specify our variable forms by taking logs.

7. Empirical Findings

This section will discuss main findings of the paper. Table 2 gives results of the baseline model. The first column represents the OLS results; second and third columns present the random and fixed effect estimates. Lastly, the forth column shows the results from using Mundlak approach. The panel data techniques consider the unobserved heterogeneity. To choose between the random and fixed effects model, Hausman test has been used and the results (given at the bottom of tables 2-6) shows that the individual country's fixed effects are interrelated with the error term as each model specification rejects the null hypothesis, i.e., the preferred model is random effects.

However, FE estimator fails to estimate the coefficients of genetic and geographical distances, which are time-invariant. To overcome this problem, we will consider a random effect model, i.e., Mundlak's (1978) approach for estimating panel data. Similarly, the model may suffer from endogeneity due to positive feedback effect between remittances and the stock of migrants. As a result, we will be using an IV approach in the study.

The two instruments used in the study includes the first and second lags of the migrant stock which are proxies for the earlier migration in the destination countries (Woodruff and Zenteno, 2007). All these instruments are exogenous as confirmed by the Hansen. J stats (Results not included in the study.)

To simplify our analysis, we will be mainly discussing results under the Mundlak approach, as it overcomes the problems of the fixed-effect model. However, the reported results will show both the FE and Mundlak results as they both show almost the same results.

In the first specification, log of remittances in million dollars is regressed onto the GDP per capita of both home and host countries, exchange rate, inflation index of the home country, migrants' stock, geographical distance and common official language. Table 2 summarizes the results of this regression.

Remittances and GDP per capita of the host country have a significant positive relationship whereas remittances are not responsive to the monetary conditions back home. It reflects the fact that if the economic conditions in the host country improve; migrants tend to send more remittances back home. This is consistent with our hypothesis and findings of Straubhaar (1986), Schiopu and Siegfried (2006), Vargas-Silva and Huang (2006) and Kemegue et al (2011) who claim that remittances are more receptive to the economic conditions at the source countries than recipient countries.

The relationship between exchange rate and remittances is ambiguous as some of the panel data techniques are showing a positive correlation, whereas under Mundlak it is negative. The negative relationship is evidence of the fact that with the appreciation of migrants' currency, they would tend to send less remittances as the same amount of money could buy more goods back in the home countries. This finding is in consistent to the results of (Lueth & Arranz, 2008).

The association between inflation in the host country and remittances is not statistically significant in any of the approaches we use. Similarly, with regards to the network effects, migrants stock is not much of a significance in impacting remittances.

Geographical distance is a significant factor affecting remittances. The negative correlation between remittances and geographical distance implies that as the distance between the host and home countries increase, the enforcement of family contracts agreed before

immigration might decrease which tends to reduce the flow of remittances (Rapoport and Docquier, 2006).

The result of the gravity variable, i.e., common official language, is consistent with the findings of our hypothesis and Zarzoso's and Ahmed's study (2014). It shows that regions sharing common language tend to remit more to each other.

Table 2: Bilateral Remittances Determinants: The basic model

Dependent variable: Log of Remittances (million dollars)

	(OLS)	(FE)	(RE)	(Mundlak)
GDP/capita (Sender)	0.559***	0.401**	0.559***	0.413***
	(0.0933)	(0.0927)	(0.0598)	(0.0649)
GDP/capita (Recipient)	-0.195**	-0.186	-0.195*	0.718
	(0.0785)	(0.102)	(0.112)	(0.711)
Exchange rate	0.138***	0.115***	0.138***	-0.0304***
	(0.0508)	(0.0135)	(0.00568)	(0.00513)
Inflation (Recipient)	0.0601	-0.163	0.0601	-0.0216
	(0.121)	(0.120)	(0.217)	(0.431)
Migrants stock	0.0252**	0.935***	0.0252*	0.0116
	(0.0118)	(0.0175)	(0.0133)	(0.0112)
Geographical distance	-0.138**	-0.111**	-0.138***	-0.373***
	(0.0688)	(0.0244)	(0.0365)	(0.0348)
Common language	0.145	0.197**	0.145***	0.432***
	(0.144)	(0.0553)	(0.0316)	(0.0246)
Constant	2.745**	0.166	2.745**	-3.177***
	(1.294)	(0.669)	(1.180)	(0.604)
Observations	746	746	746	746
R-squared	0.058	0.298	0.6277	
Number of Year	5	5	5	5
Hausman test	Prob>chi2 0.0000			

Note: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parenthesis. All the variables except dummies are in natural logs

Next, we move on to the extended model of bilateral remittances (Table 3) which includes other significant control variables that are expected to have an impact on the magnitude of remittances. Such variables include common colony, genetic and religious distances. The inclusion of these control variables does not modify the significance of most of the baseline covariates. Result of the Hausman test shows that between random and fixed effects, the latter gives unbiased estimates.

The relationship between GDP per capita in the host country and remittances is the same as in the baseline model. The home country's GDP per capita is still insignificant. A notable change occurs in the direction of correlation between exchange rate and remittances. The positive relation between these two variables implies that with the appreciation of the migrants' currency, remittances sent back home would increase. This outcome is consistent with our hypothesis and results of a study in Philippines (Yang, 2008).

Similarly, the association between remittances and other variable like inflation, migrants' stock, geographical distance and common language is the same as discussed above. The second gravity variable, i.e., common colony, is a significant factor impacting remittances which depicts that the migrants of countries sharing colonial history would tend to remit more to each other. This was confirmed by the findings of Lueth & Arranz (2006) and is consistent with our hypothesis.

Our main variable of interest, i.e., genetic distance, has the same sign as being hypothesized by this study. Genetic distance is a significant factor affecting remittances. This means genetically close countries will tend to remit more to each other. Countries which are genetically close trust each other more and have ethnic and cultural similarities (Spolaore and

Wacziarg, 2009). As a result, they might be willing to remit more amongst each other. These similarities can impact individuals from within and outside the countries. The cultural and ethnic networks help to overcome the barriers to international trade by reducing the transportation costs through migrant's networks [Rauch and Trindade (2002), Rauch and Casella (1998), Rauch (2001) and Gould (1994)]. Consequently, the volume of remittances might increase. Adding genetic distance into the regression has reduced the coefficient of geographical distance. This depicts that in terms of the spatial variables, individuals attach more importance to genetic similarities than the geographic ones. Hence, individuals remit more to the genetically close countries.

The relationship between religious distance and remittances is intuitively negative but it's not significant under the Mundlak approach. This means once we control for the spatial factors like geographical and genetic distances, network effects measured through religious distance becomes insignificant.

Table 3: Bilateral Remittances Determinants: An extended model

Dependent variable: Log of Remittances (million dollars)

	(OLS)	(FE)	(RE)	(Mundlak)
GDP/capita (Sender)	0.291*	0.161	0.291***	0.412***
	(0.148)	(0.112)	(0.0948)	(0.108)
GDP/capita (Recipient)	-0.846***	-0.740***	-0.846***	0.827
	(0.133)	(0.114)	(0.0418)	(0.522)
Exchange rate	0.198***	0.153***	0.198***	0.0946***
	(0.0488)	(0.0314)	(0.0259)	(0.0177)
Inflation (Recipient)	-1.272***	-1.186***	-1.272***	0.0507
	(0.193)	(0.181)	(0.0641)	(0.313)
Migrants stock	0.00369	0.830***	0.00369	0.0116
	(0.0146)	(0.0478)	(0.0124)	(0.00936)
Geographical distance	0.0753	0.0780	0.0753	-0.0733***
	(0.120)	(0.0434)	(0.0464)	(0.0215)
Common language	1.085***	1.018***	1.085***	0.720***

	(0.242)	(0.112)	(0.132)	(0.0877)
Common colony	1.893***	1.444***	1.893***	1.199***
	(0.270)	(0.249)	(0.0999)	(0.0608)
Genetic distance (F_{st})	-0.260**	-0.232***	-0.260***	-0.148***
	(0.103)	(0.0266)	(0.0336)	(0.0111)
Religious distance	1.026	0.887***	1.026***	0.0201
	(0.793)	(0.156)	(0.262)	(0.129)
Constant	13.55***	9.623***	13.55***	15.51***
	(1.784)	(0.799)	(0.867)	(0.709)
Observations	303	303	303	303
R-squared	0.349	0.499	0.3582	0.538
Number of Year	5	5	5	5
Hausman test	Prob>chi2 0.0000			

Note: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parenthesis. All the variables except dummies are in natural logs

The study will now discuss the results after replacing the dependent variable with remittances per capita (Table 4). Remittances per capita shows the average economic impact or the economic impact per person. There is not much difference between the factors affecting cash remittances and remittances per capita.

Remittances per capita is significantly affected by the macroeconomic conditions in the host country, exchange rates, geographical and genetic distances and gravity variables, i.e., common language and colony. Similarly, economic conditions at home and the stock of migrants do not impact remittances per capita significantly.

Table 4: Bilateral Remittances Determinants

Dependent variable: Log of Remittances per capita

	(OLS)	(FE)	(RE)	(Mundlak)
GDP/capita (Sender)	0.184	0.0561	0.184**	0.317***
	(0.152)	(0.109)	(0.0906)	(0.0984)
GDP/capita (Recipient)	-0.844***	-0.741***	-0.844***	0.874
	(0.143)	(0.130)	(0.0591)	(0.616)
Exchange rate	0.188***	0.144**	0.188***	0.0716***
	(0.0537)	(0.0399)	(0.0342)	(0.0238)
Inflation (Recipient)	-1.157***	-1.076***	-1.157***	0.142
	(0.217)	(0.184)	(0.0973)	(0.366)
Migrants stock	0.00561	0.817***	0.00561	0.0139
	(0.0160)	(0.0360)	(0.0131)	(0.0106)
Geographical distance	-0.146	-0.143**	-0.146***	-0.293***
	(0.140)	(0.0410)	(0.0444)	(0.0267)
Common language	1.141***	1.076***	1.141***	0.743***

	(0.269)	(0.146)	(0.199)	(0.146)
Common colony	1.483***	1.042**	1.483***	0.768***
	(0.276)	(0.272)	(0.0583)	(0.102)
Genetic distance (F_{st})	-0.312***	-0.285***	-0.312***	-0.234***
	(0.108)	(0.0299)	(0.0462)	(0.0459)
Religious distance	1.487*	1.351***	1.487***	0.689**
	(0.871)	(0.282)	(0.420)	(0.281)
Constant	11.65***	7.817***	11.65***	14.86***
	(1.995)	(0.938)	(0.983)	(0.906)
Observations	303	303	303	303
R-squared	0.288	0.417	0.2970	0.482
Number of Year	5	5	5	5
Hausman test	Prob>chi2 0.0000			

\/Note: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parenthesis. All the variables except dummies are in natural logs.

Lastly, we will be analyzing the results using remittances per migrant as the dependent variable. This variable is an indirect indicator of the migrants' employment type. The results, as seen in Table 5 are not much different from those of tables 3 and 4 except that the GDP per capita of the recipient countries is now a crucial factor for determining remittances per migrant. This is consistent with the findings of a study in Bangladesh (Sarkar and Datta, 2014).

The results of our analysis show that incorporating genetic distance into the regressions has significantly reduced the magnitude of other spatial variable, i.e., geographical distance. These results clearly support our hypothesis and the fact that genetic distance is more important than geographical distance.

Table 5: Bilateral Remittances Determinants

Dependent variable: Log of Remittances per migrant

	(OLS)	**(FE)**	**(RE)**	**(Mundlak)**
GDP/capita (Sender)	-0.0485	-0.0479	-0.0485	0.0839
	(0.141)	(0.0592)	(0.0604)	(0.0961)
GDP/capita (Recipient)	-0.477***	-0.477	-0.477***	0.116
	(0.131)	(0.0784)	(0.0779)	(0.0781)

Exchange rate	0.0914**	0.0913	0.0914**	-3.522
	(0.0387)	(0.0364)	(0.0363)	(3.370)
Inflation (Recipient)	-0.750***	-0.751**	-0.750***	-0.772***
	(0.189)	(0.0204)	(0.0189)	(0.0824)
Migrants stock	-0.0813	-0.0814	-0.0813	-0.0360
	(0.0764)	(0.0570)	(0.0570)	(0.0527)
Geographical distance	0.108	0.108	0.108***	0.0254***
	(0.115)	(0.0398)	(0.0393)	(0.00880)
Common language	0.820***	0.821**	0.820***	0.884***
	(0.304)	(0.0495)	(0.0513)	(0.0812)
Common colony	0.722***	0.723***	0.722***	-0.118***
	(0.200)	(0.00537)	(0.00666)	(0.0442)
Genetic distance (F_{st})	-0.197**	-0.198**	-0.197***	-0.186***
	(0.0881)	(0.00737)	(0.00742)	(0.00590)
Religious distance	0.587	0.589	0.587***	1.982***
	(0.494)	(0.230)	(0.226)	(0.397)
Constant	1.204	1.200	1.204***	35.27***
	(2.156)	(0.349)	(0.345)	(1.677)
Observations	122	122	122	122
R-squared	0.298	0.417	0.2979	0.759
Number of Year	2	2	2	2
Hausman test	Prob>chi2 0.0000			

Note: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parenthesis. All the variables except dummies are in natural logs

8. Robustness Checks

To test the validity of our results, we conducted several robustness tests:

- Firstly, we use different measures of genetic distance to prove that our variable, i.e., genetic distance, is still significant. One of the measures used is Nei's genetic distance. Nei measures the divergence in characteristics by the process of amino acid substitution. He defined the normalized identity of genes between populations which is equivalent to the proteins identity.
- The other measure of genetic distance used is the F_{st} weighted. It represents the average genetic distance between two randomly selected individuals. It's an accurate measure of average genetic distance between countries (Spolaore and Wacziarg, 2009).

- By using two different measures of genetic distance, we prove that genetic distance is still a key variable in determining the magnitude of remittances. Also, the direction of correlation is negative which means that as genetic distance between two countries increases, the magnitude of remittances would tend to go down (see Tables 6-8).
- Secondly, by using different dependent variables, i.e., remittances per capita and remittances per migrant, we can prove that genetic distance (Nei and F_{st}weighted) remains a significant variable in explaining the amount of remittances. Also, there is no change in the direction of correlation between different measures of remittances and genetic distances (see Tables 6-8).

Table 6: Robustness Check

Dependent variable: Log of Remittances (million dollars)

	(Mundlak)	(FE IV)	(Mundlak)	(FE IV)
GDP/capita (Sender)	0.368***	-0.0175	0.414***	-0.0413
	(0.117)	(0.153)	(0.107)	(0.182)
GDP/capita (Recipient)	0.711	-0.437***	0.826	-0.511***
	(0.539)	(0.141)	(0.510)	(0.131)
Exchange rate	0.0644***	0.0651	0.0973***	0.0976
	(0.0202)	(0.0769)	(0.0178)	(0.0709)
Inflation (Recipient)	0.0171	-0.747***	0.0506	-0.766***
	(0.243)	(0.175)	(0.313)	(0.175)
Migrants stock	0.00842	0.786***	0.0115	0.915***
	(0.00797)	(0.0748)	(0.00930)	(0.0723)
Geographical distance	-0.0384	0.139	-0.0663***	0.141
	(0.0526)	(0.124)	(0.0219)	(0.142)
Common language	0.692***	0.599**	0.711***	0.779***
	(0.0295)	(0.255)	(0.0880)	(0.284)
Common colony	1.009***	-0.151	1.195***	0.722
	(0.118)	(0.505)	(0.0608)	(0.566)
Genetic distance (Weighted)	-0.229***	-0.245**		
	(0.0196)	(0.108)		
Religious distance	0.147	0.732	-0.100	0.569
	(0.120)	(0.602)	(0.121)	(0.688)
Genetic distance (Nei)			-0.123***	-0.203**
			(0.0108)	(0.0906)
Constant	15.10***	2.347	15.19***	0.883
	(0.559)	(2.383)	(0.695)	(2.387)
Observations	378	150	303	120
R-squared	0.481	0.6042	0.480	0.7392
Number of Year	5	2	5	2

Note: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parenthesis. All the variables except dummies are in natural log

Table 7: Robustness Check (cont'd)

Dependent variable: Log of Remittances per capita

	(Mundlak)	(FE IV)	(Mundlak)	(FE IV)
GDP/capita (Sender)	0.121	-0.273	0.324***	-0.115
	(0.114)	(0.184)	(0.0994)	(0.233)
GDP/capita (Recipient)	0.783	-0.422**	0.871	-0.491***
	(0.557)	(0.169)	(0.597)	(0.168)
Exchange rate	0.0429*	0.0702	0.0749***	0.0826
	(0.0227)	(0.0923)	(0.0240)	(0.0908)
Inflation (Recipient)	0.0763	-0.614***	0.142	-0.673***
	(0.234)	(0.210)	(0.360)	(0.224)
Migrants stock	0.00931	0.771***	0.0138	0.899***
	(0.00861)	(0.0898)	(0.0105)	(0.0927)
Geographical distance	-0.105*	0.123	-0.281***	-0.0621
	(0.0544)	(0.149)	(0.0284)	(0.182)
Common language	0.450***	0.467	0.732***	0.950***
	(0.0807)	(0.306)	(0.147)	(0.363)
Common colony	0.572***	-0.616	0.761***	0.269
	(0.133)	(0.607)	(0.103)	(0.725)
Genetic distance (Weighted)	-0.269***	-0.283**		
	(0.0367)	(0.130)		
Religious distance	0.556***	1.227*	0.559**	1.311
	(0.0959)	(0.722)	(0.276)	(0.881)
Genetic distance (Nei)			-0.206***	-0.298**
			(0.0448)	(0.116)
Constant	14.47***	0.267	14.42***	-1.294
	(0.952)	(2.861)	(0.885)	(3.060)
Observations	378	150	303	120
R-squared	0.465	0.5065	0.465	0.6240
Number of Year	5	2	5	2

Note: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parenthesis. All the variables except dummies are in natural log

Table 8: Robustness Check (cont'd)

Dependent variable: Log of Remittances per migrant

	(Mundlak)	(FE IV)
GDP/capita (Sender)	0.0882	-0.924
	(0.0969)	(0.805)
GDP/capita (Recipient)	0.124	-0.422
	(0.0758)	(0.418)
Exchange rate	-3.640	0.0126
	(3.406)	(0.208)
Inflation (Recipient)	-0.755***	0.579
	(0.0832)	(1.245)
Migrants stock	-0.0359	1.779
	(0.0536)	(1.609)
Geographical distance	0.0335***	-0.215
	(0.00833)	(0.448)
Common language	0.897***	-0.543
	(0.0823)	(1.401)
Common colony	-0.0932**	-3.153
	(0.0418)	(4.221)
Religious distance	1.946***	-6.098
	(0.400)	(5.876)
Genetic distance (Nei)	-0.168***	0.698
	(0.00605)	(0.720)
Constant	34.84***	-3.553
	(1.699)	(19.33)
Observations	122	74
R-squared	0.751	0.3112
Number of Year	2	2

Note: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parenthesis. All the variables except dummies are in natural log

9. Conclusion

The rate of international migration has increased over the span of sixty years. As a result, there is a substantial flow of remittances to countries. The literature has been addressing one of the most important policy questions, on what are the factors that affect a country's remittances growth rate. Using a recent data set and with the addition of new variables, we will further explore this question. By means of various panel data techniques, this study examines several determinants of remittances flow to top fifteen remittances recipient countries from 2010-2014.

According to our findings, remittances flows are more responsive to the host economies vs. the recipient economies. Variables such as GDP per capita and exchange rate fluctuations of the host economies are more responsive to the magnitude of remittances than the same variables from the recipient countries.

The most important aspect of the study is that it highlights the relationship between genetic distance and remittances. The negative and significant relationship between these two variables show that migrants of genetically distant countries tend to remit less to each other. Genetic distance represents cultural and linguistic roots. As a result, genetically close countries tend to trust each other more (Ammerman and Cavalli Sforza, 1985). This means genetically close countries which share more common characteristics would remit more to each other. The result of our analysis is robust to different measurements of genetic distance such as Nei and F_{st} weighted. From our analysis, we can see that weighted measure of genetic distance gives the most significant result.

Some of the measures, like common colony and language, play a substantial role in impacting remittances. Our results also propose that the magnitude of remittances is not significantly influenced by the stock of migrants, religious distance and inflation.

The results of our analysis show that genetic distance doesn't only affect cash remittances but also remittances per capita and remittances per migrant. Remittances per capita is an important measure of comparing economic performance amongst countries. The fact that the genetic distance is inversely and significantly related to remittances per capita demonstrates that genetic distance indirectly is a key factor affecting relative average economic performance of the countries.

Similarly, remittances per migrant are inversely and significantly affected by genetic distance. Remittances per migrant, as discussed above, are an important indicator of migrants' financial situations and factors affecting remittances per migrant tend to affect migrants' financial situations as well. Therefore, genetic distance is a factor affecting migrants' financial situations.

Furthermore, adding genetic distance to our analysis has reduced the coefficient of the other spatial variable, i.e., geographical distance. This shows individuals attach less importance to geographical distance as a factor affecting remittances, once they have common cultural roots with other countries.

Lastly, the limitations on the reported data is that they underestimate the value of bilateral remittances sent through unofficial channels. Moreover, there is lack of data available related to bilateral remittances and migrants stock for certain periods and countries.

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Appendix

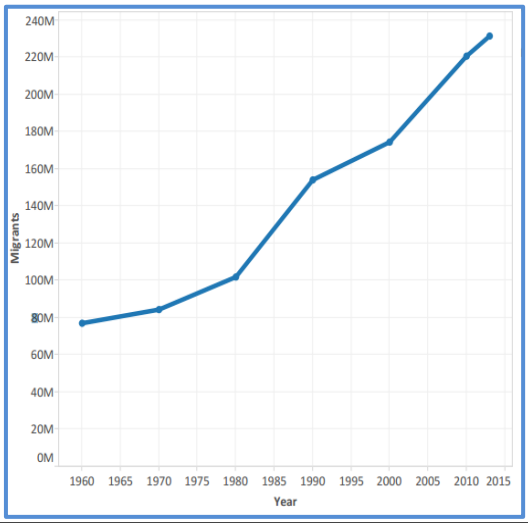

Figure 1: International Migration trend of the world

Source: Migration Policy Institute (MPI)

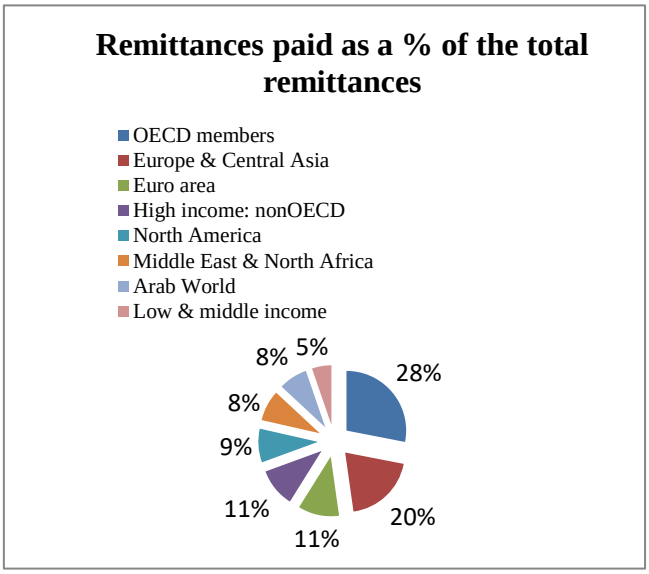

Figure 2: Remittances paid as a % of total remittances

Source: The World Bank

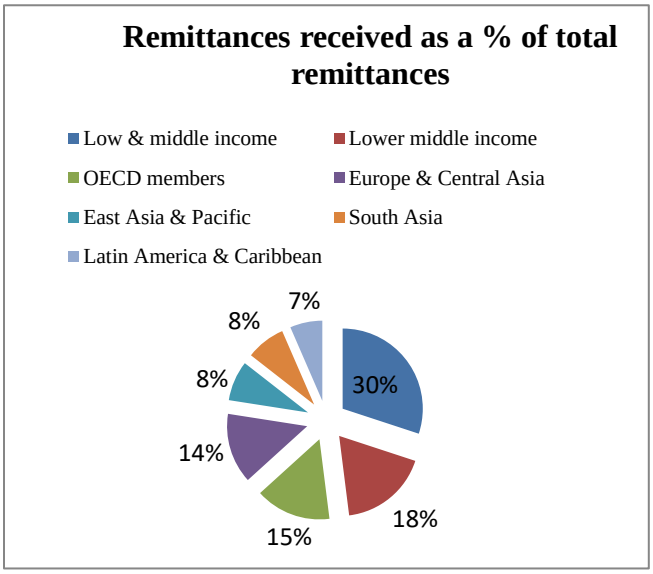

Figure 3: Remittances

Sour

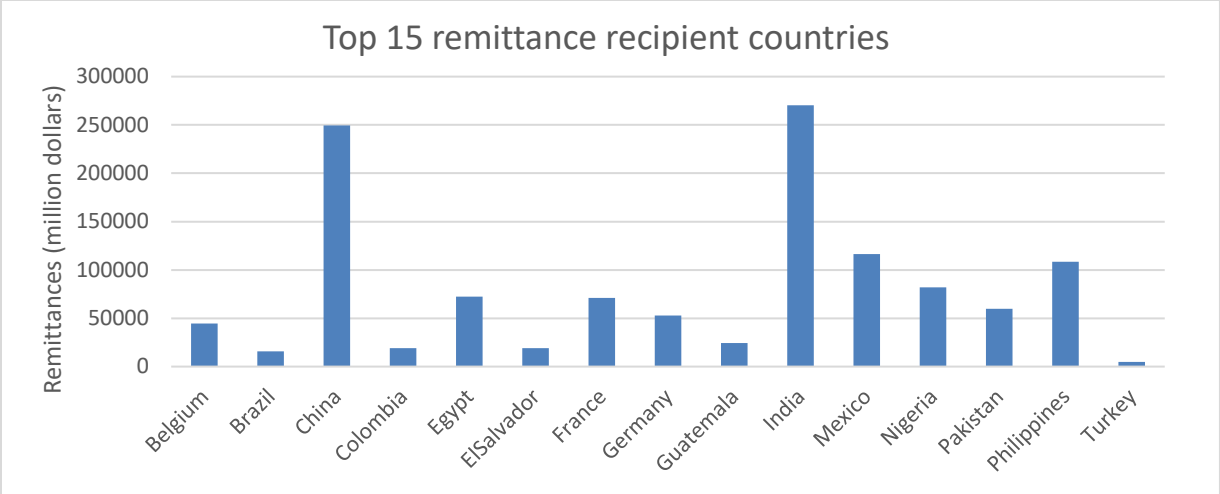

Figure 4: Top 15 Remittance Recipient Countries

Source: The World Bank

Variables	Measurement	Source	Data source
Dependent			
Bilateral remittances	Cash remittances in million dollars		State Bank of Pakistan, Migrationpolicy.org
Gravity			
Common colony	Dummy equal to 1indicates countries with a common colony and 0 otherwise	(Lueth&Arranz, 2006)	CEPII
Common official language	Dummy equal to 1indicates countries with a common official language and 0 otherwise	(Lueth&Arranz, 2006)	CEPII
Spatial			
Geographical distance	Bilateral distance from the capitals in kilometers	(Bettin, Presbitero & Spatafora, 2014)	CEPII
Genetic Distance	Allele frequencies	Cavalli-Sforza Masatoshi Nei	Cavalli-Sforza Masatoshi Nei
Network Effects			
Religious	Percentage	(Spolaore & Wacziarg, 2009)	(Spolaore & Wacziarg, 2009)
Migrants Stock	Total number of migrants residing in the respective countries	(Ahmed & Zarzoso, 2014) (Lueth & Arranz, 2006)	Bureau of Emigration & Overseas Employment, Migrationpolicy.org
Other Macro			
Inflation	Consumer Price Index in percentage	(Lueth & Arranz, 2006)	The World Bank
Gross Domestic Product (Per capita)	In current US dollars	(Ahmed & Zarzoso, 2014)	The World Bank
Exchange Rate	Official exchange rate against US Dollar	Panda & Trivedi, 2015	The World Bank

Table 1

Estimated results for Breuch Pagan (1980) LM test

Source	Var	Sd= sqrt(Var)
Log of remittances (dollars)	3.495294	1.869571
E	1.834689	1.354507
U	0	0

Test: Var(u) = 0

chibar2(01) = 0.00

Prob > chibar2 = 1.0000

White's test for heteroscedasticity

H_o: homoscedasticity against

H_a: unrestricted heteroscedasticity

chi2 (42) = 189.50

Prob > chi2 = 0.0000

Cameron & Trivedi's decomposition of IM-test

Source	Chi2	Df	P
Heteroscedasticity	189.50	42	0.0000
Skewness	16.45	8	0.0364
Kurtosis	3.94	1	0.0472
Total	209.89	51	0.0000

Correlation Matrix

	1	2	3	4	5	6	7	8	9	10
1	1.0000									
2	-0.5005	1.0000								
3	0.1955	-0.4434	1.0000							
4	0.618	0.0821	0.0378	1.0000						
5	0.5098	-0.3211	-0.0442	0.1572	1.0000					
6	-0.0526	-0.0906	0.1619	0.0868	0.2220	1.0000				
7	0.0554	-0.0716	-0.2791	-0.0807	0.0790	-0.0977	1.0000			
8	0.0912	0.0822	-0.2110	0.0013	0.1361	0.0952	0.2323	1.0000		
9	-0.1826	0.2948	-0.2062	0.4888	0.0869	0.0727	0.1634	0.1691	1.0000	
10	0.0144	0.0863	0.0896	-0.3775	-0.2760	-0.4648	-0.2072	-0.2145	-0.4692	1.0000

Table 2

Note: Number of observations: 120. All variables are in logs except binary variables. 1. GDP/capita (Sender). 2. Exchange Rate. 3. Unemployment (Sender). 4. Genetic Distance (F_{st}). 5. Geographical Distance. 6. Common Language. 7. Common Colony. 8. Migrants Stock. 9. Religious Distance. 10. GDP/capita (Recipient)

Wooldridge test for autocorrelation in panel data

H_0: no first-order autocorrelation

H_a: first-order autocorrelation is present

F(1, 4) = 23.013

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