Influencing Fertility Preferences One Dollar at a Time: The Impact of Migrants' Remittances on the Home Country Fertility Rate

26 October 2009

George Naufal
School of Business and Management
American University of Sharjah

Carlos Vargas-Silva
International Migration Institute
University of Oxford

Abstract

In this article we explore the connection between remittances and home country fertility rates. We assert that migrants' remittances may affect home country fertility in two ways. First, migrants may adopt and later transmit ideas predominant in the host country to the household. The key argument is that migrants with more attachment to the home country would be more inclined to remit money home. In this regard remittances can be seen as a proxy for the influence of the migrants on household behaviour and a gauge of the level of social norms (including fertility preferences) that are transmitted from the migrants to the home country. Second, remittances are a source of non-labour income, and given that children are typically seen as normal goods, these flows may ultimately increase home country fertility rates. Our results suggest a negative relationship between aggregate remittances and the home country fertility rate. Given that most migrants are located in countries with lower fertility rates this result is consistent with a transmission of fertility norms that dominates the effect of the increase in non-labour income on fertility. Moreover, we are also able to show separate evidence on the existence of these two channels. The transmission of ideas from migrants to the home country should be added to spectrum of ties between migration and development that is typically discussed in policy circles.

Key words: Remittances, Fertility, Migration
JEL Classifications: F24, J13, F22

Contact Information:

Naufal:
American University of Sharjah
School of Business and Management
P.O. Box 26666
Sharjah, United Arab Emirates
Phone: + (971) 6 515 2369
Fax: + (971) 6 558 5065
Email: gnaufal@aus.edu

Vargas-Silva:
International Migration Institute
University of Oxford
Mansfield Road, Oxford OX1 3TB, UK
Phone: +44 (0) 1865 287311
Fax: +44 (0) 1865 287435
Email: carlos.vargas-silva@qeh.ox.ac.uk
Web: http://users.ox.ac.uk/~qehs0697/

1. Introduction

The stock of international migrants has grown dramatically in recent years. In 2000 the International Organization for Migration estimated that there were 176 million international migrants, but this number increased to over 200 million by 2008 (International Organization for Migration, 2009). These figures indicate over a 10 percent increase in the stock of international migrants in just eight years. While this increase in impressive, some experts argue that this is just an estimate and that as argued by Castles and Miller (2009) "no one knows how many international migrants there are." Moreover, world population has also grown during this period and the stock of international migrants as a share of global population has remained fairly constant (around 3 %). As a result, it would be tempting to conclude that nothing new has developed in regards to migration during the last half century. Yet recent technological advances have facilitated the communication of migrants with the family back home. First, the telephone replaced what used to be a sluggard-pace international letter communication system. Then the email displaced the relatively costly international calling system. Nowadays several internet programs provide even better and faster communication between migrants and households (e.g. Messenger, Skype and Facebook, just to name a few). These advances in technology, in addition to a reduction of fees for transferring money across countries, have spurred an increase in the international flow of migrants' transfers. The latest estimates from the World Bank value global remittance flows to be around US$305 billion (World Bank, 2008).

While migrant workers' communication with the home country has increased, fertility rates have declined in most countries. In several developed countries (e.g. OECD

countries) fertility rates have declined to levels below those needed to secure generational replacement (Sleebos, 2003). This fact has pushed many governments in industrialized nations to develop policies aimed at promoting and facilitating childbearing. Meanwhile, in least developed nations, high population growth is still considered to be one of the hurdles for economic growth. Although women in the developing world tend to have fewer children than before, the fertility rates in these countries remain high when compared to developed countries.

The previous literature suggests that migration rates and fertility rates may be linked. First, earlier studies argue that migrants reflect fertility preferences dominant in the home country or region and that convergence towards fertility levels of the host country occurs only in the second generation. However, more recent studies typically conclude that with time the fertility behaviour of migrants comes to resemble the fertility behaviour of natives (Kulu, 2003). That is, the recent balance of evidence suggests that after some time in the host country migrants replace home country fertility norms with host country fertility standards.

While most of the prior literature has focused on the fertility behaviour of the migrants we may ask: *What happens to the fertility behaviour of those family members and friends that stayed behind in the home country?* Fargues (2007) argues that migrants adopt and later transmit to their home countries the ideas about fertility that prevail in the host country. Therefore, for countries with a considerable number of international migrants we should see a convergence of fertility rates between the home and the host countries. For each developing country the convergence is going to be unique because the selection of destination countries by domestic migrants is different. Furthermore,

migrants in some destination countries may have a stronger connection to the home country than migrants in other host countries. It is expected that the stronger the bond between migrants and the home country, the larger the flow of social norms from the host to the home country and therefore the faster the convergence of fertility rates should be between the countries.

In this paper we explore the effects of migrant remittances on the fertility rate of the home country. Unfortunately, time series data on the distribution of migrants in different host countries is often missing for many countries. Moreover, even if we have the number of migrants from one home country in each host country over time, it would still be difficult to measure the attachment of those migrants to family and friends back home. One way to measure the strength of the relationship between migrants and the families back home is to inspect the flow of workers' remittances. Arguably, migrants with more attachment to the home country would be more inclined to remit money home. That is, *monetary* transfers can be a measure of the so-called *social* remittances. Levitt (1998) describes social remittances as the ideas and norms of behaviour that flow from host to home countries through migrants.

Hence, it is not just money what flows between the host and home countries. Migrants also send behavioural expectations back home. A recent study by Spilimbergo (2009) claims for instance that the education of locals in democratic foreign countries can promote democracy in the home countries. We argue further that monetary sums remitted back home reflect the strength of the bond between the migrant and the household and can be a good gauge of the level of social remittances. Just focusing in this fact, and given that most migration takes place from high fertility countries to low fertility

countries, we would expect a negative relationship between remittances and the fertility rate of the home country.

This idea applies regardless of the main considerations for remitting. There has been considerable deliberation in the remittances literature about the migrant's main motivations to send money home. Several studies claim that migrants are altruistic individuals that are prone to watch over household's well-being and remit to enhance household's living standards. Other studies argue that there are self-interest motives for remitting such as investments in the home country or the potential gratitude of the household when returning home. In both scenarios remittances reflect an attachment of the migrant to the home country.

In addition to being a reflection of the link between the migrant and the household there is another reason that leads us to think that remittances and the fertility rate are related. In the traditional economic discourse non-labour income refers to income from all sources except employment related activities. Under this definition, remittances represent a source of non-labour income for the household. If children are normal goods, the increase in non-labour income may result in an increase in demand for children. As a result of this second channel the net impact of aggregate remittances on home country fertility rates basically remains an empirical matter.

The significant volumes of worldwide remittance flows during the precedent decades triggered a massive interest on these transfers among academic researchers. A large portion of the literature has focused on the determinants of these flows (e.g. El-Sakka, M. and McNabb, R. (1999), Vargas-Silva (2009)). Other studies have focused on the economic consequences of these monetary flows whether on the macroeconomic side

(Amuedo-Dorantes and Pozo (2004), Chami et. al. (2005)) or at the household level (Amuedo-Dorantes and Pozo (2006)). However, there are hardly any studies exploring the impact of remittances transfers on the fertility rate of the remittance receiving countries. This is an important omission because the transmission of norms such as fertility patterns from migrants to the home country can have great implications for the relationship between migration and development. In this paper our intention is to fill this lacuna by bringing the impact of remittances on home country fertility to the spotlight.

2. Theoretical Background and Literature Review

2.1 Some Theoretical Intuition

In this section, we explain further the intuition behind the relationship between the fertility rate of the home country and remittance transfers and discuss the relevant literature on the topic. Letting *FR* represent the total fertility rate in the remittance receiving country, letting *R* denote workers' remittances and letting *X* be a vector of other determinants of the fertility rate, we can write our equation of interest as:

$$FR = f(R;X). \quad (1)$$

We identify two main channels by which remittances may affect the fertility rate:

1. Remittances may reflect the strength of the relationship between migrants and the remaining household members. The greater remittances are, the stronger the household/migrant bond is and the larger the influence of migrants on the remaining members of the household. This influence includes, among other things, the decision to have children and the optimal number of children to have.

The flow of ideas between migrants and the household is expected to push the fertility of the remaining household members closer to the fertility levels prevalent in the host

country. Most migrants are located in lower fertility countries; hence, this channel suggests that remittances should be often associated with lower fertility levels in the home country.

2. On the other hand, remittances are a source of non-labour income. If children are normal goods the increase in non-labour income should result in an increasing demand for children. Dissimilarly to an increase in the wage rate (especially the female wage rate) that increases the opportunity cost of forgoing labour and investing time in childbearing activities, remittances may encourage the demand for children.

Traditional consumer theory suggests that goods that have no adequate substitutes are frequently normal goods, that is, increases in income typically lead to increase consumption of these goods. As Becker (1991) argues, there are no good substitutes for children, hence, children are customarily considered to be normal goods. Below we provide a few equations to formalize the idea behind these two channels of transmission.

Assume that household utility depends on the number of children (N) and consumption of other commodities (Z). Let k represent the time cost of having one additional child. Households are endowed with one unit of time and, therefore, the time available for income generating activities is $(1-kN)$. The household wage is represented by w and remittances, which we assume initially to be just a source of non-labour income, by R. Assuming a standard log utility function our initial choice problem is:

$$\max \ \delta_Z \log(Z) + \delta_N \log(N) \qquad (1)$$

$$\text{s.t. } Z \leq R + (1-kN)w$$

If we solve this problem for the optimal level of fertility we obtain the following result:

$$N^* = \frac{\delta_N (\frac{R+w}{w})}{(\delta_N + \delta_Z)k} \quad (2)$$

Equation (2) suggests that a rise in remittances (R) leads to an increase in the optimal number of children (N*). Remittances are a source of non-labour income and in our model children are normal goods. However, as we mentioned above, aggregate remittances are also a proxy for the transfers of ideas from the host country to the home country. It is therefore possible to claim that migrant's adopted notions affect the preferences of households in terms of children and other commodities. In order to address this other role of remittances we assume that the utility derived from children is not just based on the number of children but on the difference between the number of children in the household and a reference number of children, where the reference number of children is a function of the gap between the host country (F_H) and the domestic (F_D) fertility rates.[1] The influence of the fertility rate gap between the host and home country on desired fertility levels depends on the strength of the relationship between the household and the migrant. If the link is strong the influence of ideas from the host country to the household will be strong, if the connection is weak then we can expect a modest influence of ideas from the host country on household behaviour. As such, we assume that the reference fertility rate of the domestic household is given by $F_D + r(F_H - F_D)$, where $(0 \leq r \leq 1)$. The parameter r measures the connection between the migrant and the household, r = 0 entails that the preference factor is determined

[1] A similar assumption to this one is made in one of the models presented by Beine et. al (2008). However, they do not formalize an equation for the reference number of children and do not exploit the role of remittances as an indicator of the strength of the relationship between the household and the migrant.

exclusively by the domestic fertility rate, while $r = 1$ suggests a powerful influence from the fertility rate of the host country.

It is not possible to observe directly the strength of the relationship between the migrant and the household, but the fact that the migrant is remitting money to the household points to a strong relationship between the household and the migrant. The greater the sum of the transfers to the household (R) the larger r should be, that is $r(R)$ with $r'(R) > 0$. Remittances, therefore, represent extra-income that loosens the budget constraint of the household as non-labour income, but are also a proxy for the flow of ideas from the host to the home country. Our choice problem now becomes:

$$\max \ \delta_Z \log(Z) + \delta_N \log(N - (F_D + r(F_H - F_D))) \tag{3}$$

$$\text{s.t. } Z \leq R + (1 - kN)w$$

The solution for optimal fertility for this problem is:

$$N^* = \underbrace{\frac{\delta_N (R + w)}{(\delta_N + \delta_Z)kw}}_{First} + \underbrace{\frac{\delta_Z (F_D + r(R)(F_H - F_D)}{(\delta_Z + \delta_N)}}_{Second} \tag{4}$$

As we can appreciate from (4) if the fertility rates are the same across countries ($F_H = F_D$) then the second term disappears and we have the same result as in (2). However, for a non-zero r, $F_H < F_D$ implies that $F_D + r(F_H - F_D) < F_D$. In simpler words, if the fertility rate in the host country is lower than the domestic fertility rate, the reference number of children in the home country will be smaller leading to a smaller optimal number of children for the household. In sum, remittances in the first term of the RHS of (4) are positively linked with fertility, but as long as $F_H < F_D$ in the second term remittances are

negatively related to fertility. As we will explain below in 80 % of the cases in our data we have that $F_H < F_D$.

The main objective of this paper is to empirically examine the relationship between remittances and the home country fertility rate. As the discussion above suggests given the nature of remittance flows it is it not possible a priori to hypothesize on the net impact of these flows on home country fertility. The total effect depends on which of these two channels dominates.

2.2 Related Literature

The notion that migrants are key channels for the transmission of ideas between countries is not new. Forty years ago Joseph J. Spengler was already explaining how migration is important for the transmission of economic ideas across international borders (Spengler, 1970). Nonetheless, the focus on the transmission of fertility norms from host to home countries is relatively recent. In this regard a series of working papers have discussed ideas related to ours. For instance, Fargues (2007) uses time series data to document a negative correlation between remittances and births in Morocco and Turkey and a positive one in Egypt. The author attributes this correlation to the flow of ideas and attitudes from migrants towards their receiving counterparts. While remittances to Egypt come primarily from the Persian Gulf (countries less advanced in the demographic transition), remittances to Morocco and Turkey come mainly from Europe (that is, from countries more advanced in the demographic transition). While the ideas put forward in Fargues (2007) are appealing and innovative, the empirical analysis is conducted using simple correlation coefficients. These correlation coefficients are simple bi-variate statistics that do not allow for the inclusion of additional control factors in the estimation.

Moreover, we argue that the treatment of remittances as just a reflection of the link between migrants and households is not totally adequate given that remittances have other important implications for household behaviour (i.e. remittances represent non-labour income).

In another interesting contribution, Beine et al. (2008) study the link between international migration and fertility focusing on the impact of norms from the host country on home country fertility rates. They are able to gather evidence of a strong transfer of fertility norms from migrants to their home countries. In their paper they regard remittances as a source of non-labour income (or a method of transfers in old age for the household). Hence, while Fargues (2007) perceives remittances as just a reflection of the transfer of norms, Beine et al. (2008) conceive remittances as just non-labour income. We argue that remittances reflect the transmission of norms but are also undoubtedly a source of non-labour income. The other limitation of Beine et al. (2008) is that the authors focus on a cross-sectional analysis and as we argue below using panel data we can obtain a more realistic approximation to the impact of remittances on fertility.

Marchiori et al. (2008) develop an overlapping generations model to study the impact of high and low skilled migration on fertility decisions. As with Beine et al. (2008), they include remittances in their model as a source of compensation for the household. Moreover, while remittances are included in the model, Marchiori et al. (2008) are more interested in exploring the impact of the other variables on fertility (e.g. immigration restrictions in the host country) and just assume that all migrants remit a proportion of their foreign income.

In sum, there is a current interest in this topic and while there are certainly a few recent papers that have inquired on ideas related to our paper, we believed that our analysis is quite different and that our results can complement the previous literature on remittances/migration and the home country fertility rate. In that hope, we now proceed to introduce the data and methodology used in the analysis of this now much in vogue topic.

3. Data and Methodology

In order to be successful in our efforts we must control for a series of additional factors. In this regard, we control for the percentage of the population living in rural areas, the female labour force participation rate, income per capita, the percentage of the population that are migrants and the fertility rate in the top five destinations of migrants from each home country (weighted average).[2]

The fertility rate in rural areas is typically higher than the fertility rate in urban areas which suggests that the percentage of population living in rural areas and the fertility rate are positively linked (United Nations, 1986). We expect a negative relationship between the female labour force participation rate and the fertility rate. In simple terms, the more females participate in the labour force the higher their opportunity cost of raising children and therefore the lower the fertility rates (Yamada and Yamada, 1984). Higher income per capita typically leads to lower fertility rates so we foresee a negative relationship between this variable and the number of children per family (Docquier (2004), Jones and Tertilt (2008)). The direction of the relationship between the migration stock as percentage of the population and fertility is not completely

[2] We would have liked to control for education through literacy rates but due to data availability we could not include this variable.

straightforward. Migrants in general move from higher to lower fertility rate countries and it takes some time to adjust to the fertility levels of the host country. However, the act of migration implies a disruptive process that is often found to temporarily decrease fertility. Finally, higher fertility rates at the top 5 destinations of migrants from a certain country (weighted average) should encourage fertility in the home country.

There are several important issues concerning aggregate remittances data. For instance, countries tend to use different rules with regard as to what type of transactions are classified as remittance transfers. In order to alleviate this concern we use a broad measure of remittances from the World Development Indicators. In specific, remittances are defined as the numbers reported under the category worker's remittances and compensation of employees. This measure is more inclusive than the simple remittances series reported in the balance of payments.[3] In the regressions we use the logarithm of the total value of these transfers.

In total we have an unbalanced panel of 59 countries with data for most countries for the period 1980 to 2005 (there are a few countries for which the available data starts from 1985).[4] The World Bank records the fertility rate variable for each country following their last census. For that reason, the fertility rate measure is only available in

[3] When recommending the use a broad measure of remittances, the World Bank Remittances Factbook (2008) argues that "although the residence guideline in the manual is clear, this rule is often not followed for various reasons. Many countries compile data based on the citizenship of the migrant worker rather than on their residency status. Further, data are shown entirely as either compensation of employees or as worker remittances, although they should be split between the two categories if the guidelines were correctly followed. The distinction between these two categories appears to be entirely arbitrary."

[4] The list of countries includes: Latin America: Argentina, Belize, Bolivia, Brazil, Colombia, Costa Rica, Dominican Republic, Ecuador, Guatemala, Honduras, Mexico, Venezuela, El Salvador, Panama and Suriname. Asia: Bangladesh, China, Cyprus, India, Indonesia, Jordan, Korea, Lao PDR, Malaysia, Oman, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Syrian Arab Republic, Thailand and Turkey. Africa: Algeria, Benin, Botswana, Burkina Faso, Cameroun, Cape Verde, Comoros, Ivory Coast, Egypt, Ethiopia, Gambia, Ghana, Kenya, Madagascar, Mali, Mauritania, Mozambique, Rwanda, Senegal, Sudan, Swaziland, Togo, Tunisia, Lesotho, Niger, Nigeria, Morocco.

increments of five years. We use the total fertility rate, which measures the number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with customary age-specific fertility rates.

There are two fundamental advantages of using panel data in our analysis. First, we can increase the number of observations that we use significantly to over 300 observations for developing countries (compare to less than 150 observations for developing countries in Beine et al., 2008). Second, we are able to better model variables related to complex human behaviour such as fertility rates. It may be the case that remittances and home country fertility rates are related for a given time period, but in order for remittances to have a significant impact on fertility rates we need a relationship between these variables at different points in time. This is so because different points in time would allow us to compare countries across different stages of the demographic transition. Arguably many developing countries have moved from stage 2 of the demographic transition to stage 3 of the demographic transition in the last 30 years, and this change may bring a different relationship between host and home country fertility rates.[5] Panel data offers sequential observations of fertility and remittances and, therefore, provide an analysis which takes into account observations at diverse stages.

The other variables included in the estimation are the percentage of the population living in rural areas, the female labour force participation rate, the logarithm of income per capita, the percentage of population that are migrants and the average fertility rate of the top 5 destinations of migrants from each country. The source of the first four variables, as well as the fertility rate variable, is also the World Development Indicators from the World Bank online databases. The average host fertility rate is estimated using

[5] Refer to Lam and Marteleto (2009) for further discussion of the demographic transition.

the measures of fertility from the World Development Indicators and the information on migrant's destinations from Parsons et al. (2007). The average host fertility rate is constructed as a weighted average where the relative importance of each of the host country fertility rates is provided by the relative stock of migrants from the home country in that host country.[6] Descriptive statistics and definitions of all the variables included in the analysis are provided in Appendix 1 and Appendix 2, respectively.

We conduct a battery of estimations in order to ensure the robustness of our results. First, we conduct an ordinary least squares (OLS) estimation using the full sample of countries. Second, we conduct an estimation using the full sample and including dummy variables for region of the world. Third, we conduct an estimation using the full sample and fixed effects to control for country specific heterogeneity. Fourth, we pursue the possibility of differences in the results in response to the timing of the global demographic transition by conducting the estimation for different time periods. Next, we conduct an instrumental variable estimation in order to address potential issues of endogeneity.

We are also interested in measuring possible regional differences in the relationship between remittances and the fertility rate. Different regions of the world are in different stages of the demographic transition and this may impact the relationship between remittances and fertility. Moreover, the selection of host countries by migrants also differs by region. Therefore, after conducting an estimation using all the countries in our sample we proceed to conduct separate estimations by region. Particularly, we have an estimation using only Latin American countries (15 countries), one with only Asian

[6] The information on migrant's destinations in Parsons et al. (2007) is only provided for the year 2000. Hence, we have to assume that the migrant stock is constant over time. Nonetheless, even if the weights are fixed the weighted host fertility rate changes across time following changes in host countries fertility rates.

countries (17 countries) and one with just African countries (27 countries). We conduct both, OLS and country-specific fixed effects estimations using the regional sub-samples. Finally, we try to disentangle the two effects discussed in Section 2. The estimations explained above will provide us with valuable information regarding the net effect of remittances on home country fertility, but we also put effort in providing evidence on the existence of the two channels of transmission.

Figure 1 shows the average fertility rate of the countries in our sample and the average volume of remittances received over time. As we can appreciate from the figure, for all regions, while remittances have been increasing overtime (especially since 1985), fertility rates have been decreasing. Let us also look at Table 1 in which we report correlation coefficients for remittances and the fertility rate. As the Table shows, for the full sample and for all the sub-samples, the correlation of remittances and fertility rates is negative. This is in general consistent with the results provided by Fargues (2007). However, as we mentioned above, in order to establish a relationship between remittances and fertility rates we need to include more control variables in the estimation. Is this relationship going to hold once we control for other important determinants of fertility? In the following sections we use a multiplicity of econometric approaches to answer this question.

4. Empirical Results

4.1 Results for the Full Sample

We begin our econometric analysis by showing the results if we include all the countries for which we have all necessary data in one estimation. The outcome of this exercise is reported in Table 2. In column 1 we display the results from OLS, in column 2 we

present the results obtained adding regional dummy variables, while in column 3 we report the results obtained using country specific fixed effects. The coefficients in the table are reported with robust standard errors in parenthesis.

Focusing first in column 1, notice that all the control variables have the desired sign. The average fertility of the host countries has a positive impact on home country fertility. Hence, migration to countries with lower fertility rates is related to lower domestic fertility rates as we expected. The share of the population living in rural areas has a positive effect on fertility. As the previous literature shows, for many countries fertility rates are much higher in rural than in urban areas. Also consistent with the previous literature, GDP per capita and female labour force participation both have a negative relationship with fertility. Finally, the migrant stock has a positive impact on fertility.

With regard to remittances we can see that these flows have a negative impact on fertility levels. As we mentioned above, most migration takes place from countries with higher fertility rates to countries with lower fertility rates (in fact, in 80% of the cases in our sample we have lower host country fertility than the home country fertility). After sometime in the host country, migrants may adopt host country fertility norms and later they transmit those norms back to the home country. However, how much behaviour gets transmitted depends on the strength of the relationship between the migrant and the family back home. We argue that remittance flows can be a good measure of the strength of that relationship.

Next we include regional dummy variables in the estimation. As McKibbin (2006) argues, there has been a global demographic transition from high to low population growth rates but at different rates in different regions. For instance, while population

growth rates were higher for Latin America than for Asia in the 1950s and 1960s, population growth rates are now higher in Asia than in Latin America. Nevertheless, in both cases population growth rates have decreased dramatically during the last 50 years. Hence, it is imperative to conduct the estimation controlling for different regions of the world. In specific, we focus on three regions: Latin America, Asia and Africa.

The regressions with regional dummy variables are displayed in column 2 of Table 2. The results are not affected by the inclusion of regional dummies. It is still the case that remittances, the average fertility of the main host country destinations, female labour force participation and GDP per capita have a negative impact on fertility rates, whereas the portion of population living in rural areas has a positive impact on home country fertility. It is interesting to note that both the dummy for Latin America and Asia are significant indicating the possibility of interesting dynamics across regions.

Still even using the regional dummy variables there may be some country specific heterogeneity left that we may want to control for and, therefore, we conduct a fixed effects estimation. Those results are reported in column 3 of Table 2. When analyzing the results from the fixed effects estimation we have to keep in mind that we only have 343 observations and 59 countries (or groups in the estimation). Including the fixed effects changes the results to some extent. First, GDP per capita and the migrant stock are not significant any longer. Moreover, the remittances coefficient, while still negative, is also not significant. On the other hand, the result regarding the fertility of the host countries, population in rural areas and female labour force participation do not seem to be affected by the inclusion of fixed effects.

As we discussed above there has been a global demographic transition taking place around the globe. It is argued that several developing countries were in the midst of fundamental changes in their demographic behaviour during the 1980s and early 1990s.[7] Hence, we have decided to report the results after splitting the sample between the periods 1980-1995 and 2000-2005. The results of this exercise are reported in Table 3. As we can appreciate from Table 3 during the period 1980-1995 both the OLS and fixed effect estimations (columns 1 and 2, respectively) indicate that remittances are negatively associated with fertility. Still, when we look at the period 2000-2005 we can observe a similar result to that of Table 2 in which the fixed effect estimation results is a negative remittances coefficient that is not significant, while the OLS remittances coefficient is negative and significant.

We want to explore further this difference in the results of the OLS estimation and the fixed effects estimation. One way to gain additional insights on this issue is to divide our sample in regions and conduct both types of estimations in each region. Furthermore, this division will allow us to compare the results in regions that, as we mentioned above, are in different stages of the demographic transition. As the regional dummies estimation showed there may be some interesting regional dynamics in fertility behaviour. We conduct this regional estimation in the next section.

4.2 Results for the Regional Samples

Table 4 reports the results of the estimations when we limit our sample to countries in a certain geographic region. In columns 1 and 2 we report the OLS and fixed effects results when we focus on Latin American countries only. It seems that for Latin America the

[7] For instance, Rashad (2000) shows that by 1980 about a quarter of the Arab countries had not experienced any decline in fertility, but that by 1995 all Arab countries had experienced a drop in fertility.

results for remittances are consistent across estimations. In both cases, remittances seem to have a negative impact on the fertility rate. Interestingly, for the case of Latin America, it seems that while in the OLS estimations the host country fertility rate has the expected sign, in the fixed effects estimation this variable turns negative.

It also seems that the results for remittances are consistent for the African countries. In both cases remittances have a negative impact on the fertility rate and although the level of significance decreases in the fixed effects estimations, the coefficients are somewhat similar in size. Moreover, when we include the fixed effects it seems that only remittances, the average fertility of the host countries and the portion of the population living in rural areas are significant determinants of fertility for these African nations.

Nevertheless, as can be seen in columns 5 and 6, for the Asian sub-sample results change when we use different estimation methodologies. While in the OLS estimation we have the now familiar result of remittances having a negative impact on the fertility rate, this result turns around in the fixed effect estimation. It seems that when we take into account country specific heterogeneity the evidence on a negative impact of remittances on the fertility rate disappears for Asian countries. This is the only time in the previous nine regressions in which we get a positive coefficient for remittances. Therefore, we can say that our results are relatively robust for all regions, except for Asia. It may be the case that for Asian countries the non-labour income effect is stronger that the effect of any transmission of ideas between countries. However, in order to explore more the robustness of our results we need to account for possible endogenous relationships

between our variables. We do that in the next section by conducting instrumental variable estimations.

4.3 Instrumental Variable Estimation

It is possible to argue that fertility rates may also affect the level of remittance transfers. That is, there may be reverse causality with respect to remittances and fertility rates. A bigger household means that more people are dependent on migrant's transfers and, therefore, altruistic migrants may be encouraged to remit more. However, the impact of household size on remittances should be especially strong if there are recently born children in the household that depend on migrants money transfers. These recently born children do not have the option to enter the labour force to provide for themselves and the other members of the household may have to spend more time in childbearing activities limiting their time available for income generating activities. Therefore, in a certain year, at the macro level, the home country fertility rate may impact the flow of remittances. In order to address this possibility, in this section we present estimations in which we use instrumental variables for remittances.

The first set of instruments that we use is constructed based on the instruments used by Adams and Page (2005), Amuedo-Dorantes (2004) and Barajas et al. (2009). Adams and Page (2005) used three instruments for remittances: distance between the remittance sending and receiving countries, level of education, and government stability. The first variable cannot be used without strong further assumptions. Data on remittances bilateral flows is not readily available. Therefore, Adams and Page (2005) simply estimate the distance between the country and the main remittance sending country. However, for many developing countries remittances originate in several countries or

regions and it is not clear that we should just use one of these regions as an instrument (e.g. 48 percent of the remittances flows to the Philippines come from the United States, 16 percent from Europe, and 15 percent from the Middle East).[8] We prefer not to make such strong assumptions and as such we do not use distance as an instrument. The second variable used by Adams and Page (2005) is education. As suggested by many previous studies education may influence fertility, hence, it is not a good instrument for our purposes. Still, we are left with government stability and we include this variable as one of our instruments. Furthermore, in addition to government stability we also include political risk as an instrument. This variable typically measures the problems businesses may face as a result of political decisions. We think that given the previous evidence that remittances are often related to investment in the home country, this variable can also be a valid instrument for remittances.

Amuedo-Dorantes and Pozo (2004) used as instruments education, the rate of vaccination coverage of children less than one year of age, the crop production index and the livestock index. As we mentioned above we are not able to use education as an instrument. Hence, we are left with the last three variables: the rate of vaccination, the crop production index and the livestock production index. Valid instruments have to fulfil two necessary conditions: have explanatory power over the variable that is being instrumented and be uncorrelated with the independent variable. The first of these conditions is going to be tested below using the traditional F test, but we feel that the rate of vaccination fails the second condition because is directly related to health conditions in the home country and hence to fertility. Hence, we discard this instrument.

[8] See http://www.bsp.gov.ph/statistics/keystat/ofw.htm.

Finally, Barajas et al. (2009) recently proposed the use of the ratio of remittances to GDP of all the other countries as an instrument for remittances. This variable reflects the functioning of the global remittances system and can provide some indication of the reduction in the costs of remitting across time. At the same time, this variable is not related to the fertility rate of that specific country. As such, we also add this variable to our set of instruments. In sum, in order to instrument remittances we used the crop production index and the live stock production index of the remittance receiving country obtained from the World Development Indicators, the government stability index and the political risk index for these countries from the Political Risk Services group and the ratio of remittances to GDP of other recipient countries.[9]

Due to data limitations we lose an important chunk of the observations in the instrumental variable estimation. In particular, we are left with only 171 observations in one of the estimations. Nevertheless, we think that even with this limitation it is important to show the robustness of our results when we instrument for remittances. We do not estimate regional instrumental variable estimations due to the limited number of observations that we have for each region.

The results of the instrumental variable estimation for the OLS and the fixed effects approach are presented in Table 5. As it is clear from columns (1) and (2) in Table 5, the results are consistent when we use an instrument for remittances.[10] In fact the evidence of a negative impact of remittances on the fertility rate and a positive impact of host country fertility on the home country fertility rate is stronger in the instrumental

[9] We tried using several sub-groups of these instruments and the results were generally consistent to the use of different combinations of these variables.

[10] We also verified the t statistics and the F statistic of the first stage regression in order to make sure that we have good instruments. The F statistic is reported in Table 5.

variable estimation. While in the standard fixed effects estimation the remittances coefficient was negative but not significant, in the instrumental variable estimation the coefficient is negative and significant.

As we suggested above, the tricky part in an instrumental variable estimation is to find a good instrument. Therefore, in columns (3) and (4) we limit the set of instruments to just the one proposed by Barajas et al (2009) given that this instrument is a relatively recent contribution to the literature on remittances. Moreover, given the nature of this instrument the number of observations in the estimation increases considerably. The results are consistent with the results obtained with the full set of instruments; however, the results are more robust due mainly to the larger number of observations.

4.4 Separating the Two Channels

The previous discussion suggests that for the most part remittances have a negative effect on the fertility rate of the home country. We have so far attributed this effect to the influence of norms adopted by the migrant in the host country on household behaviour in the home country. Nonetheless, as the theoretical discussion in Section 2 suggests it is also possible for remittances to have a positive effect on fertility given that these flows are essentially non-labour income for the household. As such, in the section of the paper we will try to disentangle these two effects. That is, instead of just showing the net impact of remittances of home country fertility, we aspire to provide some evidence on the existence of these two transmission channels.

We proceed as follows. In addition to including the regular remittances measure in the estimation we also include a measure of the reference number of children. In the theoretical section we used $F_D + r(F_H - F_D)$ as the measure of the reference number of

children. We already have the values for F_H and F_D as host and home fertility rates, but we are missing a measure of *r*. In the theoretical section we just purported that *r* is increasing in the volume of remittances. Therefore, we estimate *r* as log (remittances)/log(GDP). This estimate assumes that those countries with larger remittances/GDP ratios are subjected to a greater influence of fertility norms from the host country.

The results of this exercise are reported in Table 6. In this case we can appreciate at the top of the Table that the coefficient on remittances is positive. We take this coefficient to represent the impact of remittances as non-labour income. On the other hand, the reference number of children has a positive impact on remittances. This is also as we expect, given that a larger reference number should translate to higher fertility rates. Remember that for most countries this reference number is going to be smaller than the domestic fertility rate given that the fertility gap is typically negative. Thus, by including these two terms we can at least provide some evidence of the existence of these two channels.

5. Conclusion

Recent decades have witnessed an increase in the flow of workers' remittances and a decrease in global fertility rates. In this paper we study the relationship between these variables. We argue that it is not just money what flows between the host and home country. Migrants may also adopt and later transmit to their families in the home country ideas and norms of behaviour from the host country. However, given that the monetary sums that migrants send back home reflect the strength of the bond between the migrant and the household we can use these flows as an indicator of the level of norms transfers.

Nevertheless, remittances may also affect the budget constraint of the receiving households in ways that may ultimately increase fertility rates.

We study the relation between remittances and home country fertility rates using panel data for developing countries. We use several econometric specifications like simple OLS, a regression with regional dummies, fixed effects estimation, regional estimations and instrumental variable estimations in order to test the robustness of our results. In general, results consistently point out to a negative relationship between remittances and home country fertility rates. This result is quite intuitive if we take into account that most migration takes place from countries with higher fertility rates to countries with lower fertility rates. Therefore, migrants in the host country send ideas about lower fertility targets to their families in the home country. The level of these ideas is captured by the amount of remittances sent. While results are consistent across estimations there seem to be some differences in results for the different specifications for the case of the sub-sample of Asian countries.

We are also able to provide some evidence of the existence of the two channels for the impact of remittances on the fertility rate. The "pure" remittances channel that can be related to non-labour income increases fertility rates, while the "transmission of norms" channel decreases fertility rates. Other factors that seem to affect the fertility rate include the fertility rates of the main five destinations of migrants from a certain country (weighted average). This variable for the most part seems to have a positive effect on fertility, which reinforces the fact that there is a transmission of norms from migrants to their families back home. Some other factors that are already well established in the literature as determinants of fertility such as GDP per capita, female labour force

participation and the portion of population in rural areas were also found to be important determinants of fertility in most estimations.

In summary, the findings of this paper are consistent with the notion that migrants send more than money back home, they also send values and social norms adopted from the host country. This transmission of ideas should be added to the spectrum of links between migration and development that is typically discussed in policy circles. We expect for this transmission of norms and ideas to become increasingly relevant for policy discussions in the future as technological advances facilitate communication across countries even more.

References

Adams, Richard H. Jr. and Page, John. (2005). Do International Migration and Remittances Reduce Poverty in Developing Countries? *World Development*, 33(10), 1645–1669.

Amuedo-Dorantes, C. and Pozo, S. (2004). Worker's Remittances and the Real Exchange Rate: A Paradox of Gifts. *World Development*, 32(8), 1407-1417.

Amuedo-Dorantes, C. and Pozo, S. (2006). Migration, Remittances and Male and Female Employment Patterns. *American Economic Review*, 96(2), 222-226.

Barajas, A.; Chami, R.; Fullenkamp, C.; Gapen, M. and P. Montiel (2009) "Do Workers' Remittances Promote Economic Growth?", International Monetary Funds, Working Paper No. 09/153.

Becker, G.S. 1991. A Treatise on the Family, Harvard University Press.

Beine, M., Docquier, F. and Schiff, M. (2008). International Migration, Transfers of Norms and Home Country Fertility. IZA-Working Paper No. 3912.

Castles, Stephen and Miller, Mark J. 2009. The Age of Migration: International Population Movements in the Modern World. Fourth Edition. Palgrave.

Chami, R., Fullenkamp, C., Jahjah, S. (2005). Are Immigrant Remittance Flows a Source of Capital for Development? IMF-Working Paper, 52(1), 55-81

Docquier, F. (2004). Income distribution, Non-Convexities and the Fertility-Income Relationship. *Economica*, 71(282), 261 – 273.

El-Sakka, M. and McNabb, R. (1999). The Macroeconomic Determinants of Migrant Remittances. *World Development*, 27(8), 1493-1502.

Fargues, P. (2007). The Demographic Benefit of International Migration: A Hypothesis and its Application to Middle Eastern and North African countries in Ozden, C. and M. Schiff (eds.), International migration, economic development and policy, World Bank and Palgrave Macmillan: Washington, DC.

International Organization for Migration (2009), Global Estimates and Trends at http://www.iom.int/jahia/page254.html.

Jones, L., Schoonbroodt, A., Tertilt, M. (2008). An Economic History of Fertility in the U.S. in Frontiers of Family Economics in Frontiers of Family Economics, ed. by P. Rupert, vol.1, pp. 165-230. Emerald Press.

Kulu, H. (2003). Migration and Fertility: Competing Hypotheses Re-examined. Max Planck Institute for Demographic Research, Working Paper 35.

Lam, D. and L. Martelelto (2008) Stages of the Demographic Transition from a Child's Perspective: Family Size, Cohort Size, and Children's Resources. Population and Development Review, 34(2), 225-252.

Levitt, P. (1998) Social Remittances: Migration Driven Local-Level Forms of Cultural Diffusion. *International Migration Review*, 32(4), 926-948.

Marchiori, L., P. Pieretti and B. Zou, 2008. Migration and Human Capital in an Endogenous Fertility Model. Institute of Mathematical Economics, Bielefeld University, Working Paper 409.

McKibbin, W. (2006). The Global Macroeconomic Consequences of a Demographic Transition. *Asian Economic Papers*, 5 (1), 92-134.

Parsons, C.R., R. Skeldon, T.L. Walmsley and L.A. Winters. (2007). Quantifying International Migration: A Database of Bilateral Migrant Stocks. World Bank Policy Research Working Paper, No. 4165.

Political Risk Service Group. The PRS Group online data base www.prsgroup.com

Rashad, H. (2000) Demographic Transition in Arab Countries: A New Perspective. *Journal of Population Research*, 17 (.I), 83 – 101.

Sleebos, J. (2003). Low Fertility Rates in OECD Countries: Facts and Policy Responses, OECD Social, Employment and Migration Working Papers, 15.

Spengler, J. (1970) Notes on the International Transmission of Economic Ideas. *The History of Political Economy*, II (Spring), 133 – 151.

Spilimbergo, A. (2009) Democracy and Foreign Education. *American Economic Review*, American Economic Association, 99 (1), 528-543.

United Nations. (1986). Rural-Urban Residence and Fertility: Selected Findings from the World Fertility Survey Data. Department of International Economic and Social Affairs, Population Division, 1986. vii, 69 p. (ESA/P/WP/95.)

Vargas-Silva, C. (2009) Crime and Remittance Transfers. *Eastern Economic Journal*, 35 (2), 232 – 247.

World Bank. 2008. Remittances Factbook.
http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTDECPROSPECTS/0,,c
ontentMDK:21352016~pagePK:64165401~piPK:64165026~theSitePK:476883,00.html.

Yamada, T. and Yamada, T. (1984). Married Women's Labor Force Participation and Fertility in Urban Japan. NBER Working Paper No. 1362.

Figure 1 – Remittances and Fertility Rates Across Regions for Countries in the Sample

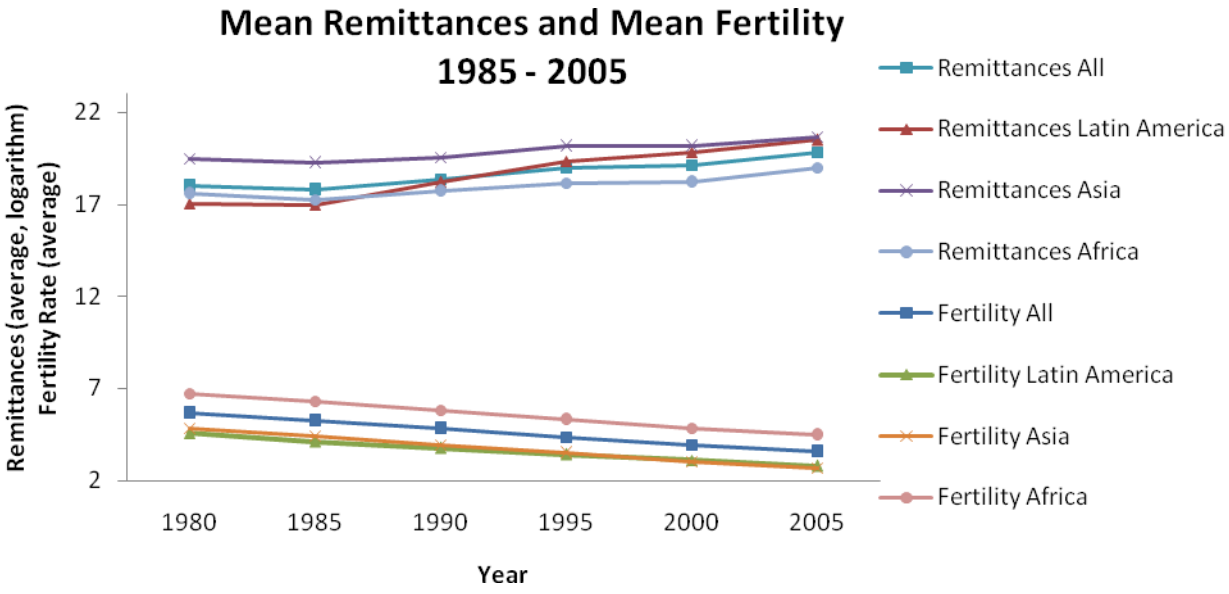

Table 1 – Correlation Coefficients between Log of Remittances and Fertility

Sample	Correlation Coefficient
Full	-0.46
Latin America	-0.51
Africa	-0.43
Asia	-0.28

Table 2 – Macroeconomic Determinants of Fertility: *Full Sample*.

Variable	(1)	(2)	(3)
Remittances	-0.218***	-0.174***	-0.0587
	(0.0249)	(0.0252)	(0.0545)
Host Fertility Rate	0.340***	0.261***	0.686***
	(0.0439)	(0.0460)	(0.132)
Pop. Rural Areas	0.00907*	0.0167***	0.0698***
	(0.00540)	(0.00563)	(0.0118)
Female Labour Force Participation	-0.0162***	-0.0147***	-0.0193*
	(0.00364)	(0.00359)	(0.0110)
Income Per Capita	-0.591***	-0.471***	0.0423
	(0.0948)	(0.0963)	(0.277)
Percentage of Migrants	0.0486***	0.0588***	-0.00131
	(0.0101)	(0.0108)	(0.0411)
Asia Dummy	–	-0.777***	–
		(0.174)	
Latin America Dummy	–	-0.303*	–
		(0.163)	
Observations	343	343	343
R^2	0.657	0.682	0.696

Note: (1) OLS estimation, (2) OLS estimation with regional dummies, (3) fixed effects estimation. Robust standard errors are in parenthesis. *, **, *** indicate 10 %, 5 % and 1 % level of significance.

Table 3 – Macroeconomic Determinants of Fertility: *Different Time Periods*.

Variables	1980 – 1995		2000 – 2005	
	(1)	(2)	(3)	(4)
Remittances	-0.221***	-0.132***	-0.116***	-0.0270
	(0.0307)	(0.0450)	(0.0355)	(0.0484)
Host Fertility Rate	0.304***	0.713***	0.331***	0.719***
	(0.0505)	(0.155)	(0.0752)	(0.160)
Pop. Rural Areas	0.0168**	0.0602***	-0.0101*	0.0384
	(0.00730)	(0.0106)	(0.00566)	(0.0231)
Female Labour Force Participation	-0.0186***	-0.0184*	0.000577	-0.0181*
	(0.00500)	(0.0109)	(0.00437)	(0.0100)
Income Per Capita	-0.527***	0.127	-0.803***	-0.369
	(0.126)	(0.234)	(0.0969)	(0.472)
Percentage of Migrants	0.0664***	0.0110	0.0274***	0.0219
	(0.0106)	(0.0240)	(0.00995)	(0.0378)
Observations	226	226	117	117
R^2	0.632	0.688	0.750	0.635

Note: (1) and (3) OLS estimation, (2) and (4) fixed effects estimation. Robust standard errors are in parenthesis. *, **, *** indicate 10 %, 5 % and 1 % level of significance.

Table 4 – Macroeconomic Determinants of Fertility: *Regional Samples*.

Variable	Latin America		Africa		Asia	
	(1)	(2)	(3)	(4)	(5)	(6)
Remittances	-0.103***	-0.126***	-0.172***	-0.209*	-0.282***	0.291***
	(0.0339)	(0.0375)	(0.0463)	(0.107)	(0.0689)	(0.0814)
Host Fertility Rate	0.598***	-0.813*	0.194***	0.476***	0.136	1.248***
	(0.202)	(0.400)	(0.0429)	(0.153)	(0.159)	(0.126)
Pop. Rural Areas	0.0240**	0.0561***	0.0316***	0.0757***	-0.000319	0.0753***
	(0.0103)	(0.0167)	(0.00803)	(0.0193)	(0.0165)	(0.0117)
Female Labour Force Participation	-0.0262***	-0.0209*	-0.00451	-0.0410	-0.0446***	-0.0256
	(0.00876)	(0.0111)	(0.00540)	(0.0387)	(0.00881)	(0.0194)
Income Per Capita	-0.372	-0.181	-0.422***	-0.150	-0.635***	-0.00232
	(0.252)	(0.663)	(0.107)	(0.465)	(0.232)	(0.275)
Percentage of Migrants	-0.0384	0.0632**	0.00723	0.0213	0.0347**	-0.0465
	(0.0282)	(0.0243)	(0.0235)	(0.115)	(0.0157)	(0.0353)
Observations	85	85	158	158	100	100
R^2	0.699	0.851	0.633	0.707	0.584	0.806

Note: (1), (3), (5) OLS estimation, (2), (4), (6) fixed effects estimation. Robust standard errors are in parenthesis. *, **, *** indicate 10 %, 5 % and 1 % level of significance.

Table 5 – Macroeconomic Determinants of Fertility: *Instrumental Variable*.

Variable	All IVs		Barajas et al. (2009) IV	
	(1)	(2)	(3)	(4)
Remittances	-0.329***	-0.243***	-0.585***	-0.511***
	(0.107)	(0.0746)	(0.149)	(0.177)
Host Fertility Rate	0.284***	0.474***	0.302***	0.527***
	(0.0751)	(0.127)	(0.0556)	(0.120)
Pop. Rural Areas	0.000485	0.0654***	0.00288	0.0343**
	(0.00878)	(0.0121)	(0.00699)	(0.0165)
Female Labour Force Participation	-0.0157**	0.00110	-0.0279***	0.0168
	(0.00613)	(0.0106)	(0.00650)	(0.0161)
Income Per Capita	-0.719***	0.523*	-0.609***	0.129
	(0.147)	(0.270)	(0.108)	(0.213)
Percentage of Migrants	0.0535***	-0.0261	0.0220	-0.0222
	(0.0135)	(0.0328)	(0.0157)	(0.0331)
Observations	171	171	343	343
R^2	0.63	0.64	0.44	0.45
F-statistics of 1st Regression	5.6	17.5	12.4	24.0

Note: (1) and (3) OLS estimations, (2) and (4) fixed effects estimations. Robust standard errors are in parenthesis. *, **, *** indicate 10 %, 5 % and 1 % level of significance.

Table 6 – Macroeconomic Determinants of Fertility: *Additional Controls*

Variables	(1)	(2)
Remittances	0.113***	0.260***
	(0.0159)	(0.0400)
$F_D + r(F_H - F_D)$	3.901***	3.578***
	(0.153)	(0.322)
Host Fertility Rate	-2.988***	-2.566***
	(0.135)	(0.316)
Pop. Rural Areas	-0.00448*	0.0249***
	(0.00234)	(0.00788)
Female Labour Force Participation	-0.000653	-0.00961
	(0.00192)	(0.00591)
Income Per Capita	-0.251***	-0.336**
	(0.0450)	(0.136)
Percentage of Migrants	0.0424***	-0.00663
	(0.00667)	(0.0197)
Observations	343	343
R^2	0.913	0.903

Note: (1) OLS estimation, (2) fixed effects estimation. Robust standard errors are in parenthesis. *, **, *** indicate 10 %, 5 % and 1 % level of significance.

Appendix 1 - Descriptive Statistics

Variable	Mean	St. Dev.
Fertility	4.56	1.66
Remittances	9.46e+08	2.45e+09
Host Fertility Rate	3.26	1.64
Pop. Rural Areas	57.67	20.02
Female Labour Force Participation	50.48	18.20
Income Per Capita	1757.22	2294.40
Percentage of Migrants	3.88	7.91
Political Risk Index	56.92	12.11
Government Stability Index	7.19	2.37
Livestock Production Index	79.79	22.30
Crop Production Index	80.48	20.72
Ratio of Remittances to GDP of all other recipient countries	0.040	0.008

Appendix 2 - Definitions of Variables

Variable	Source
Fertility: Total fertility rate represents the number of children that would be born to a woman if she were to live to the end of her childbearing years.	World Development Indicators (WDI)
Remittances: Workers' remittances and compensation of employees comprise current transfers by migrant workers and wages and salaries earned by non-resident workers.	WDI
Population Rural Areas: Rural population is calculated as the difference between the total population and the urban population.	WDI
Female Labour Force Participation: Labour force participation rate is the proportion of the population ages 15-64 that is economically active.	WDI
Income Per Capita: GDP per capita is gross domestic product divided by midyear population.	WDI
Percentage of Migrants: Migration stock is the number of people born in a country other than that in which they live.	WDI
Political Risk Index: Political risk index is calculated using a 17 risk components in which 12 are based on monthly forecasts and 5 based on a five-year forecast horizon.	PRSGroup
Government Stability Index: Government stability index is measured on a monthly basis based on *International Country Risk Guide* with a scale of 0 to 12 where 0 represents countries with very unstable governments and 12 countries with very stable governments.	PRSGroup
Livestock Production Index: Livestock production index includes meat and milk from all sources.	WDI
Crop Production Index: Crop production index shows agricultural production for each year relative to the base period 1999-2001. It includes all crops except fodder crops.	WDI