REMITTANCES, SAVING, INVESTMENT, AND SCHOOL ENROLLMENT IN DEVELOPING COUNTRIES

BY

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This dissertation prepared under my direction by:

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DEDICATION

To my family for everything I am and will ever be

To Bill for helping me to dream

To Kathy and Mary Ann for their ever-present love, like God's

To Stan whose casa I know will always be my casa

To many others, like Giacomo, Cate, Kristine, Neil, Tim, and Christina, who have shared laughs, study times, love, and friendship.

And, of course, to a beautiful mind!

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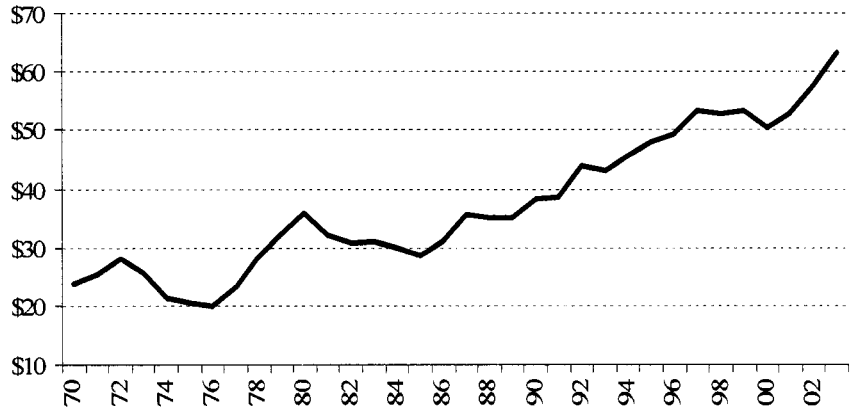
INTRODUCTION

> This giant transfer of wealth crisscrosses the Earth in millions of trickles, a few hundred dollars at a time, sent by workers who have assumed much of the burden of Third World Development. Their remittances—private aid from poor to the poorer—offer a rare chance to accumulate savings; invest in schooling, housing or a small business; and rise to the middle class. (Richard Boudreaux, "The Seeds of Promise," *Los Angeles Times*, April 16th, 2006).

This dissertation deals with the major issues highlighted by Boudreaux in his article above. One of the effects of globalization has been the movement of goods and capital around the world. Although highly restricted, the movement—documented and undocumented—of labor has also increased due to globalization. A result of this increase has been an increase of remittances. Remittances, what foreign workers send back to their home countries, have grown not only in size, but also in importance to many developing countries. In 1970, for example, an index composed of countries with the longest remittances data available put the level of remittances for those countries at 23.6 billion US Dollars. This amount had almost tripled to 63.7 billion in 2003, the latest year of available data. And for the entire world, the amount was almost 80 billion. This suggests remittances have become an important source of foreign exchange for many developing

countries. Figure 1 shows the behavior of remittances since 1970 for the 37 countries in the index.

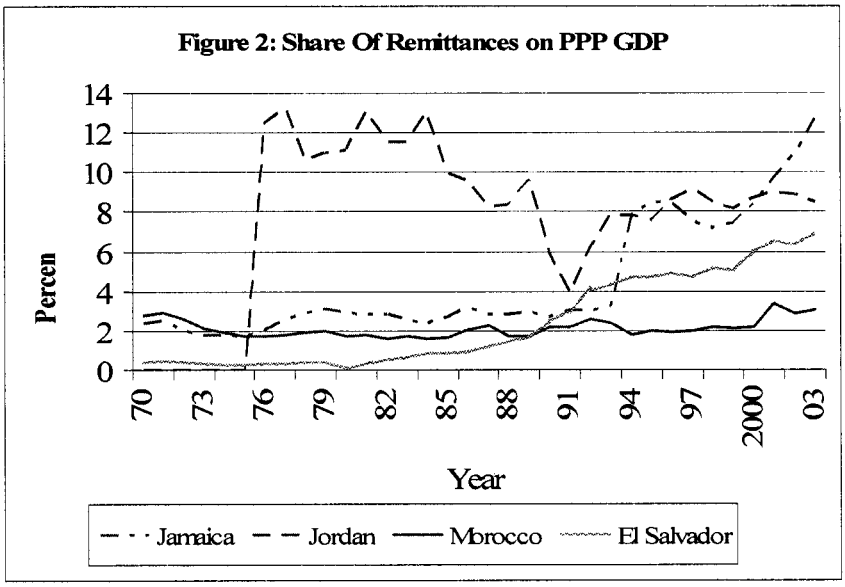
Figure 1: Total Remittances
(In Billions of constant 2000 US Dollars)



Note: This "World" Index includes 37 countries with the longest remittances data available. Some of the countries included in this index are not included in the present study. Also, "Worker's Remittances" only are used to calculate this index.
Source: World Development Indicators Online and author's calculations.

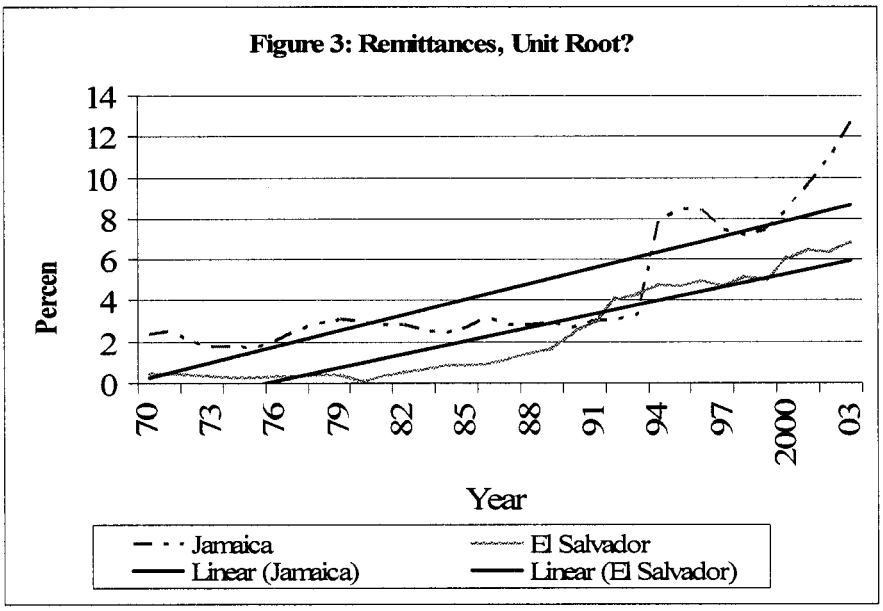
However, the story is not as clear for all countries. The share of remittances as a share of GDP for the world has fallen, from an estimated 4.01 per cent in 1970 to less than one per cent in 2003, and this may be due perhaps to the increasing regional integration taking place in Europe and other parts of the world. This apparent fall masks the importance that remittances have for many developing countries. If we take a subset of developing countries for which the share of remittances on GDP is above 1.5 percent of GDP, we are able to see how these remittances have become important for the economic wellbeing and development of these countries. For the 62 countries studied in this paper, the fall in the share of remittances on GDP has not been as dramatic—it fell from of 7.34 percent to 5.82 percent. Countries like the Dominican Republic, El Salvador, Jordan, Cape Verde, Yemen and Jamaica have had remittances shares on GDP of over 10 per cent for many years, and in some of these countries the share has actually increased.

Figure 2 compares graphically the behavior of remittances for some of these countries. From the figure, it may seem as if remittances have a unit root. However, it seems that there are more regional similarities than a stationary trend for most countries. Performing unit root tests to check on the stationary of the series is not possible in this study due data limitations. Even in the full yearly sample, we would have at most 34 data points for each country. An Augmented Dickey Fuller test suggests that 500 data points would be acceptable. However, adding a trend line to some of the country graphs gives us a primitive way to see if there is a trend in the series. Figure 3 shows the remittances data for two countries that depend heavily on remittances. The trend seems to show that remittances have increased for those two countries over the period of study. A word of caution should be added here. Not every country in this sample will show a similar pattern. In fact, the share of remittances for some countries has declined over time. What can be said is that there may be regional similarities in the behavior of remittances for many countries.



Source: World Development Indicators Online, 2005, and author's calculations.

Studying why remittances have increased in these countries is worthy of study. White (2006), for example, has studied the link between the source and destination countries and what this means in terms of intra-industry trade and remittances. Studying how these remittances impact the economic life of these countries is of most importance, especially as the shares of savings, consumption, and investment as percent of GDP change due to the inflows of foreign exchange. But the impact of remittances on labor-sending economies is not limited to financial changes. The impact can be seen in issues such as education, poverty, and inequality, to name a few.



Source: World Development Indicators Online, 2005, and author's calculations.

In this dissertation, I analyze the impact of remittances on the shares of savings and investment as percent of GDP using pooled data from 62 developing countries. In addition, I study the impact remittances have on school enrollments. Finally, as the beginnings of future research, I also study the impact on poverty and income distribution that remittances have. One reason why this is important is that many migrants come from the poorer rungs of society and are usually from the countryside. Thus, as they migrate

and send money back, they impact the poverty levels of the lower quintiles and of the rural sector in a country. One reason for this may also be because many migrants, especially from Latin America, come from indigenous groups or tribes, and migration radically changes their view and their status in society.

The paper is divided as follows. In the first part of chapter one, I review the literature on remittances but from a general perspective. Many authors have stated that most of the literature on remittances is anecdotal and very few academic papers have been written on the subject (Orozco, 2002, 2003, 2005). Therefore, the literature on remittances is vast but not rigorous enough to provide much basis for modeling economic analysis. In each chapter, I give a short review of the literature as it pertains to the more specific issues at hand. In part two chapter one, I present an overlapping generations model that can be used to analyze the maximizing behavior of migrants and their decision to migrate as well as their decisions to save, invest and get an education. I present the main features of the basic model that I will develop in each chapter to emphasize what pertains to that chapter. The emphasis in this model is on showing how remittances enhance national investment (by way of small, pooled savings) and enhance a household's investment in education and in improving their standard of living in the home country. For the empirical investigation, I use this model as a basis but primarily focus on a simpler model of current account accounting to analyze the macroeconomic impact of the savings individuals make on the national saving rate.

Chapters 2 and 3 show that two channels help increase the kinds of capital most lacking in developing countries: human and physical. Chapter three analyzes the impact of remittances on educational achievement. The chapter takes a macroeconomic approach

using some variables that have been used in microeconomic-based studies to analyze the determinants of school enrollment. The chapter concludes that the prospects of migration can serve as an incentive to attain higher human capital and that remittances are an example of those incentives while also serving to fund higher educational attainment.

In chapter 4, as a beginner for future research, I briefly develop some tests to see how robust the link between several measures of remittances and poverty is. The results show that not all measures of remittances and regression specifications support the statement that remittances help reduce poverty. The results also show that the greatest impact in reducing remittances occurs at the $2 poverty level. This shows that those most benefiting from remittances are not the poorest but those with some minimal level of initial resources. Finally, in the conclusion of the paper I summarize the results and offer some further possibilities for research and some policy implications.

In chapters two and three, I have settled on 62 developing countries for two reasons. I have considered those developing countries for which there are remittances data for at least ten years. The remittances data has several shortcomings studied elsewhere in the literature (Bilsborrow, et al, 1997, for example). And so I have chosen, for ease of comparison, to stay with those countries that have reported remittances figures as presented in the *WDI*. There are a few other countries for which remittances data exists since before 1970, but those countries can hardly be considered developing in the world today. For example, Greece and Portugal were the poorer countries in the European region in the 1970's, but they can hardly be considered to have the same development experience as, say, El Salvador or Mali, and much of that difference is not attributable to economic conditions alone. Thus, I chose not to include countries that have much higher

income levels today. Second, from those countries for which there is remittances data, I chose only the countries that have in the average at least a remittances ratio of half of one percent of PPP GDP in the last two periods of study. This allows me to concentrate on those countries for which remittances are important. This may seem as resulting in a self-selection bias, however, the levels of remittances gives us an idea as to the importance of migration in those countries. Countries with very little migration would have not interest in developing migration and remittance policies. Given that the data on poverty and inequality is much scarcer, I use only the 62 countries from the first two chapters to obtain data on poverty and inequality. Thus, the number of countries from the original sample is reduced to a few given that many of those countries have no data on poverty and inequality. To deal with this self-selection bias econometrically, I run some of the important results in different samples or groups of countries to check on the robustness of the results. It appears that the results are not generally driven by a few countries.

SURVEY OF THE LITERATURE AND THE BASIC MODEL

1. The Literature on Remittances

Many authors have stated that most of the literature on remittance is anecdotal and very few academic papers had been written on the subject up to a few months ago. The literature on remittances was vast but not rigorous enough to provide much basis for modeling economic analysis. That, however, has been dramatically and quickly changing in the past twelve to eighteen months. Most of the papers focusing on remittances were based on anecdotal stories and a few theories trying to relate remittances to growth and most specially the uses of remittances in the recipient countries.[1] The literature that acknowledged the importance of remittances and calls for remittances to be used as a tool for development is vast. The ILO and several other institutions have conducted surveys of the literature to try to capture what the main findings of the literature are.[2] The findings

[1] Peter Gammeltoft, in his paper "Remittances and other Financial Flows to Developing Countries," presented an attempt to formalize the study of remittances by analyzing data from the World Bank. His attempt was good but did not use regression analysis to show the importance and impact in developing countries of these remittances.

[2] The ILO's Shivani Puri and Tineke Ritzema, in their paper "Migrant Worker Remittances, Micro-finance and the Informal Economy: Prospects and Issues," and Deborah Waller Meyers, from the Tomás Rivera

have tended to emphasize the importance of remittances and to suggest some theories as to the causes of remittances and the uses of remittances. Some of this literature has done very well in describing how migrants use their funds in the home country and in explaining even income differences at the village level. For example, Oded Stark, J. Edward Taylor, and Shlomo Yitzhaki study two different villages in Mexico and link the difference in their income and education levels to the fact that both villages, even when they are only a few miles apart, have different migration rates to the United States (Stark, Taylor, and Yitzhaki (1986)).

More formally, the empirical literature on immigrant remittances has tended to focus on two issues: the motivation or the reason to remit and the impact of remittances (de la Briere, et al (2002)). The research on the motivation for remittances falls into two kinds of theories: the "endogenous" theories of migration and the portfolio theories. Thus, the "endogenous migration" approach explains remittances and their level as a result of a set of economic variables that imply some difference in the wage levels in the countries involved, the number of family members, and the actual stock of migrants from a given country abroad. The member of the family who moves abroad and remits does so either for altruistic or self-interested reasons. Those that try to explain remittances as a migrant's desire to invest in the home county as a result of a "portfolio" decision usually focus on investment and insurance decisions of the migrant and the family.

Among some of the major papers relying on this "endogenous" approach, is an IMF staff paper written in 1998. The paper, titled "El Salvador: Recent Economic Developments," devoted a section to "Workers' Remittances Trend and Prospects." The

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Policy Institute in her paper "Migrant Remittances to Latin America: Reviewing the Literature," present very good contemporary surveys of the literature.

paper tried to model the major *causes* of remittances to El Salvador. Using the stock of Salvadoran workers abroad, the weekly earnings of construction and service sector employees in the US, the length of stay of these workers in the US and a dummy variable, the model showed that remittances to El Salvador had risen dramatically in the late 1980's and 1990's because over half a million Salvadorans had left El Salvador and settled mainly in the United States. Thus, as they remitted money to help their families, the level of total remittances to El Salvador surged. The results from this regression were quite impressive with an R-square of 0.965 for the unrestricted equation and also for the Error-correction model. Yet, the main conclusion from this paper was that remittances to El Salvador would decline as the stock of workers settles in the host country and no longer see a need to remit back to their home country. The direct result from this conclusion was that the prospects from continued growth of remittances up to that period and thus their impact on El Salvador's future growth were low.

However, remittances to El Salvador not only have increased since 1998, but have reached almost two billion a year, representing over 14% of GDP in 2003, an increase of almost four percentage points since 1998. This failure of most papers to account for this growth of remittances in many developing countries in spite of the correct specification of the models and the correct statistical projections has caused other authors to try to capture not only an altruistic motivation to remit but also an "attachment" measure to the home country. Thus, Jacques Bouhga-Hagbe (2004) wrote an article entitled "A Theory of Worker's Remittances With an Application to Morocco." In this article, Bouhga-Hagbe presented the idea that the level of worker's remittances in Morocco is highly tied not only their degree of altruism (say, their parents), but also to their attachment to

Morocco. Using co-integration techniques, he presents a model in which the worker abroad tries to maximize utility subject to the usual budget constraints. However, in maximizing her utility, the worker also takes into consideration her family's utility in Morocco. The worker, in addition, invests part of her savings in Morocco both in financial and nonfinancial assets. Therefore, Bouhga-Hagbe (uses the growth rate of the construction industry in Morocco to serve as an instrumental variable for the nonfinancial investment in Morocco by Moroccans living abroad. He shows, in addition, that even while modeling for financial diversification through interest rate differentials, this part of the model does not seem to be empirically corroborated in Morocco. Bouhga-Hagbe includes this interest rate differential to test the second strand of theories in the literature, the portfolio approach, which states that the migrant chooses to save and invest in the home country because there is an arbitrage opportunity (captured obviously through the interest rate differential and the country risk). Bouhga-Hagbe's model explains remittances to Morocco very well and begins to place remittances as a source of foreign exchange that could be used positively for development. Rajan and Subramanian have recently also recently found that remittances have a more positive impact on the exchange rate than aid (Rajan and Subramanian, 2005)

But, making a point that remittances do not seem to affect long term growth in developing countries (and thus tending to another type of papers, those focusing on the effects of remittances), in their paper entitled "are Immigrant Remittance Flows a Source of Capital for Development?", Ralph Chami, Connell Fullenkamp, and Samir Jahjah (2003) suggest that remittances may actually lower the labor participation rates in the migrant-sending countries. This may be due to the fact that those who are left behind do

not exert as much effort in their jobs as they do not expect their chances for growth and higher salaries to be much improved. The authors try to show that if remittances are negatively related to growth in the home country, they might be negatively related because remittances in fact decrease workers' efforts in the home country. Viewed this way, remittances are a substitute for the foregone or the low income in the labor sending countries. This, the authors suggest, gives rise to the moral hazard problem as the migrant does not have a way of seeing how much effort is being exerted by those left behind to ensure they are financially independent (Chami, Fullenkamp, and Jahjah (2003)). The migrant continues to send money back home ("to remit") because the migrant is "altruistic," and wishes to supplement the low income of her family back home.

The authors propose alternative modifications of this basic model, for example, by having a common slope in the panel, and by having one- and two-way fixed effects equations. Whichever equation is regressed, the results seem to show that remittances and growth in the recipient country are negatively related. The authors state that this is proof that remittances in fact adversely affect growth through the effort of the workers who are left in the home country. In contrast, they mention the positive relationship that has been found between FDI and growth in most papers. Thus, their ending conclusion is that remittances "do not appear to be a significant source of capital for economic development" (Chami, Fullenkamp, and Jahjah (2003)). However, the authors do acknowledge that there may be other reasons why remittances are counter-cyclical with home country growth. Dean Yang has found that in fact remittances may be countercyclical because migrants abroad may be taking advantage of the exchange rate

especially when there is a slowdown or to aid relatives who are starting up new business as the economy hits a high unemployment in the formal sectors.

Chami, Fullenkamp, and Jahjah acknowledge that an extension of their model may deal with the idea that sending workers abroad may be an investment strategy by the family per se. But they do not model this and consider it an issue for further research. Here is where my contribution enters the picture.

Another way to look at the impact of remittances in developing countries, I propose, would be to see whether they behave as actual exports of labor or as capital flows. It is not clear even from the definitions given by the IMF and the World Bank exactly what remittances are and even less clear how they behave. Sometimes, the behavior is that of exports, other times they seem to be inflows of capital that help alleviate financing constraints and fuel purchases of nontradables, especially in the construction sector. Here we would not be trying to "explain" remittances. Instead, they could be considered exogenous to country performance, or as exports and financial flows behave—they go through cycles linked to the business cycle and are subject to the vagaries of the exchange rate regimes, crises and other issues. Here the point would be to look at remittances in the long term. That is, we would look at whether remittances can be used for development (investment in education, improvement of the standard of living, improvements in infrastructure and communications) that are only seen in the longer term and are not completely related to the business cycle. Thus, I propose a model in which a "multinational" household is considered. The workers in this family make education and labor decisions based on the returns to education they will get whether they stay in the home country or migrate abroad. After all, this is the case of most migrant families in

most developing countries. The migrant family in this age of globalization is a family who may consider two countries their home and will have ties--financial, nonfinancial, and educational--in both countries. Thus, this "bi-national or multinational" family will make labor, retirement, and savings decisions that affect more than one country. The impacts of their decisions are very interesting. . .

2. The Model and its implications

The entire issue for a worker who faces migration prospects, when making migration decisions, hinges on the maximization of the net earnings the worker will achieve, whether the worker expects to find a job in the tradables or the nontradables sectors of the economy (other authors have proposed the domestic and international farm and nonfarm sectors[3]).

Here I am assuming that migration is possible and that all the worker faces are some costs to migration. Stark and Wang have introduced some probability to the migration event and have also added the role of public subsidies in education to achieve a socially optimal level of education (Stark and Wang, 2001). I simply take it as assumed here. Their results and mine vary only in the assumptions of the models and the role of government in education, but not in the crucial two results that the higher productivities are what create the prospects of arbitraging those differences trough migration and increase the worker's incentive to achieve a higher education. Like with Stark and Wang's model, the conclusions of the model presented here apply to workers in any sector. Furthermore, I use some principles from Kremer and Chen (2002) and from McLeod et al (2005) to focus on the role of education and savings in an OLG Model.

[3] For example, Jorge Mora and J. Edward Taylor (2005) distinguish between the farm and non farm sectors in Mexico and the United States to talk about the determinant of migration from Mexico to the United States.

We can begin with the assumption that a young worker, with any given level of education, faces a basic production function that depends on the country (and the sector within that country) where the worker chooses to work. The basic production function is of the augmented Solow type without capital (to focus on the role of education). The home country faces the following production function:

$$PQ = AH^{\alpha}L^{1-\alpha} \qquad (1.1)$$

Where P is the price of the domestic output, Q is the total output, A is the total factor productivity in the country; H is a measure of the productivity of years of schooling, and L is the amount of labor employed. This is a Cobb Douglas production function with Constant Returns to Scale (CRTS). We could make the production function also IRTS and allow for spillover effects; however I will work with the CRTS function. We could make a further distinction within both the tradables and nontradadables sectors. For example, the non-traded service sector can be said to be composed of jobs like housekeeping, restaurant and tourism service, education (even bi-lingual), health care, construction labor (masons, engineers), landscaping, hairstyling, and the like, while the nontradable good sector would be composed of the construction output, local transportation, cement manufacturing, etc. I do this in the appendix. We can add capital to this production function but, for the moment, we want to highlight the role of labor in the production of nontradable good, especially services.

In this case, the value of the worker's Marginal Product of labor is:

$$PA(1-\alpha)\frac{H^{\alpha}}{L^{\alpha}} = PA(1-\alpha)h^{\alpha} = \psi \qquad (1.2)$$

Which is the return to human capital investment if the worker stays in the home country.

The exchange rate and the Purchasing Power Parity conversion factors are supposed to show these differences when one accounts for wages between countries. Yet, it has been shown that PPP, while a useful tool to be aware of the differences in purchasing powers, does not hold across countries. More will be said and shown about this later.[4] It is this TFP which will make a difference for countries that have the same type of production function, as we are assuming here. We could also interpret the higher productivity as the rewards from migrating but it seems better to interpret it simply as the productivity that is inherent in more technologically advanced and stable economies. That productivity is not affected by the migrant's skill labor or anything the migrant does. It is, rather, a product of the environment into which the worker migrates.[5] And in the case of the values of the output, and returns to factors of production, it will be the difference in exchange rates that are not explained that will give rise to a certain "arbitrage" migrants from whichever education level take advantage of. This last point can be more clearly seen when we consider the actual wages the migrant worker can receive at home and abroad.

The real wage for the worker in the home country in this setting is simply equal to the marginal product of labor minus the costs of obtaining an education (where these costs are linear with the years of schooling):

$$w = A(1-\alpha)h^{\alpha} - \gamma h$$

[4] For now, let it suffice to say that, for example, a housekeeper or cleaning person (or our barber in the story of the main body of the text) makes much less in a developing country than in a developed country and that such wage difference is not accounted for by the PPP theory alone.

[5] This would explain why people of every skill level tend to migrate from poorer and less stable economies. A worker with only a primary or elementary education level has better opportunities to earn a higher income in a country with a higher TFP, just as a doctor with a much higher education level has an opportunity to earn a higher income in the same country with that higher TFP.

And since the worker wants to maximize his net earnings, the worker's maximization problem gives us the net wages of the worker:

$$w_h = A\alpha(1-\alpha)h^{\alpha-1} - \gamma \qquad (1.3)$$

And solving for h:

$$\tilde{h} = \left(\frac{A\alpha(1-\alpha)}{\gamma}\right)^{\frac{1}{1-\alpha}}$$

Which would be the amount of education that will maximize the worker's earnings if he or she stays in the home country. Notice again that the higher the productivity in the home country, the higher the amount of education the worker will decide to achieve.

However, the worker (again, especially the non-tradable service sector worker) realizes that, by migrating, the worker can face another production function—that of the recipient country:

$$P^*Q^* = A^*H^{\alpha}L^{1-\alpha}$$

Notice that the only difference between the home-country production function and the recipient-country (abroad) production function in terms of actual or real output is the different TFPs (A and A^*). We assume for now that, for the worker to be induced to migrate, the TFP of the recipient country is sufficiently larger than that of the home country that migration is a desirable option. So, we assume that $A < A^*$ by a significant amount. This is not far-fetched when we consider that the TFP in an economy is mainly considered a residual of many tings that are not explained, like infrastructure, networks, social capital, institutional and economic stability, among others. Thus, a country with more infrastructure, economic stability, better networks, and higher social capital will have a higher TFP and will thus be more productive even using the same type of labor as

input. Robert Hall and Charles Jones (1999) make this point in great detail.[6] We could also interpret the higher productivity as the rewards from migrating or simply as the productivity that is inherent in more technologically advanced and stable economies. That productivity is not affected by the migrant's skill labor or anything the migrant does. It is rather a product of the environment into which the worker migrates. This would explain why people of every skill level tend to migrate from poorer and less stable economies. A worker with only a primary or elementary education level has better opportunities to earn a higher income in a country with a higher TFP, just as a doctor with a much higher education level has an opportunity to earn a higher income in the same country with that higher TFP. We will add to this difference the "unexplained" difference in purchasing powers even when accounting for the exchange rates via the difference the prices of these same services because of the productivity in the tradables sector in each country.

The value of the marginal product of the worker's labor is, in the recipient country:

$$P^* A^* (1-\alpha)\frac{H^\alpha}{L^\alpha} = P^* A^* (1-\alpha)h^\alpha = \psi^* \qquad (1.4)$$

If the worker decides to migrate, the worker will face some migration costs, M, and thus the real wages in the recipient country have to account for that as well. Assuming that markets always clear, the marginal productivity of labor equals the wage. The simple functional form of the real wage rate the worker would receive at any time would be thus a function mainly of the worker-migrant's marginal product of labor minus the costs of migrating:

$$w^* = A^* (1-\alpha)h^\alpha - \gamma h - rM \qquad (1.5)$$

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[6] See for example, Robert Hall and Charles Jones, "Why Do Some Countries Produce So Much More Output Per Worker Than Others?, *The Quarterly Journal of Economics*, February 1999)

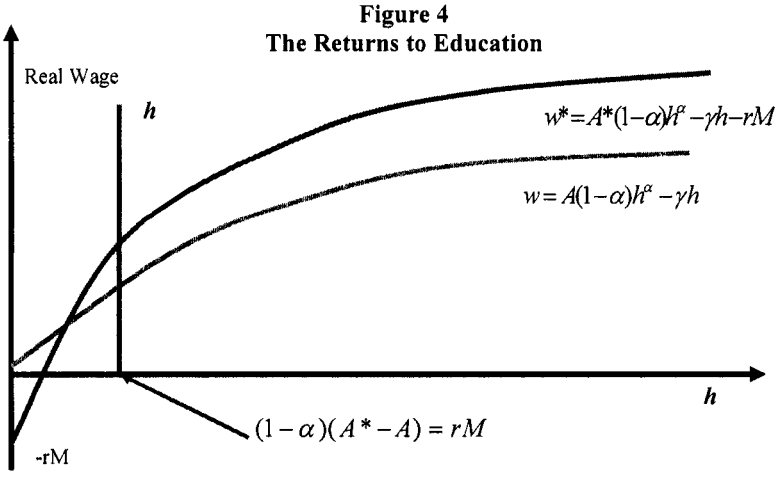
Notice that, for now, the only difference in earnings is the TFP and the level of education the worker achieves. Therefore, the same worker now faces an h that depends on the productivity:

$$\tilde{h} = \left(\frac{A^{*}\alpha(1-\alpha)}{\gamma}\right)^{\frac{1}{1-\alpha}} \qquad (1.6)$$

So, since the return to human capital investment is now given by equation (1.4) while the net earnings are given by equation (1.5) and since A^{*} is assumed to be greater than A, migrating is a desirable option for people of any skill level.

Now we must qualify this. As long as there is a difference between the returns to education at home and abroad and this difference is greater than the costs of migrating, people will migrate. Formally, this is so whenever $w^{*} - w > rM$ or, more specifically, $(1-\alpha)(A^{*} - A) > rM$. Notice that in this setting the worker simply has a choice in terms of the maximization of h and this he can do taking either A^{*} or A as given. Clearly, the higher the returns to h because of the productivities involved the more there will be an incentive to achieve more education. And if the worker maximizes h assuming A^{*}, the worker will choose a higher educational achievement. Figure 4 shows this graphically:

Figure 4
The Returns to Education



In this explanation of the wage differentials, two crucial aspects are worth emphasizing: the role of the difference in productivities that is not equalized and the role of the exchange rate to account for the attractiveness of returning to the home country to take advantage of cheaper costs there. First, let us remember that the labor cost in the nontradables sector is influenced by the productivity in the tradables sector. That is, in countries in which the tradables sector is more dynamic and more productive, the cost of labor in the nontradables sector will also be higher because the opportunity cost is higher. Simply put, the price of nontradables is a multiple of the price of tradables, and the multiple depends on the productivity of the two sectors:

$$P_N = P_T(\frac{A_T}{A_N})$$

Where, P_T is the average price of tradables, P_N is the average price of the nontradables in both nontradables sectors, and A_T is the average productivity in the tradables sector while A_N is the average productivity in the nontradables sector. This simply tells us that the higher price of tradables is due to the higher productivity of the tradables sector. This clearly ties the returns to the inputs of production in the nontradables sector to the productivity of the tradables sector. In addition, the domestic value of the migrant's return to human capital can be expressed in terms of the exchange rate, if we define the exchange rate in the following form:

$$P = EP^* \Rightarrow E = \frac{P}{P^*}$$

Where P is the price level in the home country, P^* is the price level abroad or in the recipient country and E is the nominal exchange rate. Both of these prices are a weighted average of the tradables and nontradables sectors combined.

Notice that in the way we have defined price levels depending on the ratio of tradables and nontradables, we can write EP_N^* as:

$$EP_N^* = P_T^*(\frac{A_T^*}{A_N^*})$$

In this case, we can say that then $e = \frac{A_N}{A_N^*}$. That is, the exchange rate can be seen as the difference in productivity in the come country and the recipient country. Again, this does not seem far-fetched when we see that a growth in productivity appreciates the exchange rate and a slow down in productivity causes depreciation in the exchange rate. So the value of the domestic currency increases in terms of the foreign currency with a higher TFP and decreases with a lower TFP. We can further make a simplifying assumption, that $e = \frac{A}{A^*}$. That is, that the real exchange rate is a weighted average of the difference in productivities in all the sectors combined in each country.

In addition, we can see that the investment on human capital (even in the home country) depends on this difference in productivities. That is, equation (1.2) can be written as the value of the investment in human capital even in terms of the foreign productivity (especially if the migrant intends to migrate after graduating from school) thus:

$$\psi = P\frac{A^*}{A}(1-\alpha)Ah^\alpha = P*A^*(1-\alpha)h^\alpha \quad (1.7)$$

Which can also be written as:

$$\psi = P_T^* A_T^*(1-\alpha)h^\alpha$$

This last equation clearly shows that the worker's return to that same level of education can be increased by migrating. Notice that while education takes place in the home country, the amount of education the migrant chooses to have is dependent on the returns to education but abroad and not in the home country.

And so people move north. . .

Once the worker migrates, and begins working, the worker sends some of that salary back home:

$$R = \lambda w^*(h)$$

Where R represents the amount of money the worker remits back home, it is a portion of the worker's salary. Now, using a two-period model, we can describe how the worker decides obtain an education, save, and send money back home. In the first par of her life, the worker migrates and earns wages abroad. In the second part of her life, the worker returns home to retire. The worker will obtain higher wages abroad in the first part of her life but decides to retire in the home country, where the costs of nontradables are much lower. Thus, her accumulated savings during retirement will go farther. For example, during the first part of her life, the worker experiences migration and education costs but during the second part of her life, the worker faces costs such as healthcare, housing, household help—all of which are nontradable. Thus, the maximization problem is:

$$\underset{h}{Max} V(c) = c_1 + \beta c_2$$

Where $c_1 = w^* L(1-\phi) - R$ and $R = \lambda[w^* L(1-\phi)]$ implying that $c_1 = [1-\lambda]w^* L(1-\phi)$,[7] and $c_2 = (1+r)e[\lambda w^* L(1-\phi) - \mu F]$.[8]

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[7] We do not need to explicitly state migration and education costs, as they are already included in w^*, the real wages abroad or in the recipient country.

Where F is the number of family members the worker sends or gives money to as gifts, and μ is a coefficient that shows the worker's benevolence or attachment to those relatives; φ is the amount of the worker's lifetime that will be spent not working (in retirement in the home country); and e is the real exchange rate.

In the first period, young workers get an education, go to work abroad and earn wages. They remit to their home countries a portion of those earnings to save them and thus have a retirement fund. In the second period, the worker returns home to live off the accumulated savings and the interest rate earnings of those savings. Thus, the decision to be made is how much time to work and how much education to get. Therefore, solving for the maximization problem and finding the amount of h that will maximize lifetime utility we have:

$$\bar{h} = \left(\frac{A^* \alpha(1-\alpha)(1-\lambda)}{\gamma[(1-\lambda) + e\beta(1+r)\lambda]} \right)^{\frac{1}{1-\alpha}} \tag{1.8}$$

Several things are worth noting here. Notice that maximizing h to maximize lifetime utility simply adds some more terms to $\bar{h}$. But the basic issues remain, $\bar{h}$ is positively related to A^*, the foreign productivity; in addition, now that we are accounting for period two and for the exchange rate, we see that the amount of education also depends (negatively)on the exchange rate, the interest rate and the discount rate. The higher the interest rate, the less the worker feels the need to achieve a higher level of education, for example. Notice also that substituting the exchange rate for the difference

[8] Literally, the workers' remittances are what become the worker's savings in the home country, while a portion of those savings can be given to relatives as goodwill gifts or saving's management costs. Also, the worker does not have to necessarily work in the nontradables sector abroad. I model the decision in this way simply to emphasize that anybody can migrate, not just skilled labor.

in productivities in equation (1.8), we have a formula for education which depends on exogenous variables:

$$\bar{h} = \left(\frac{A^* \alpha(1-\alpha)(1-\lambda)}{\gamma[(1-\lambda) + \frac{A}{A^*}\beta(1+r)\lambda]} \right)^{\frac{1}{1-\alpha}} \tag{1.9}$$

The model can be extended in several ways. For example, we could add children to the utility function. This would show an influence on the migrant's childbearing and schooling decisions. For now, I have chosen to present the simplest model so as to be able to fix ideas as to how remittances could influence saving and education decisions.

REMITTANCES, SAVINGS, AND INVESTMENT

2.1. Introduction

In this chapter, I analyze the impact of remittances on the shares of savings and investment as percent of PPP GDP using pooled data from 62 developing countries. A long-standing "stylized fact" about remittances is that they increase consumption but do not increase savings and investment in an important way.[1] That is, that the recipients of remittances use this extra income to simply spend it on consumption. That does not seem to be the case at the microeconomic level, as Richard Adams has shown (2005). This "stylized fact" also does not seem corroborated by the data at the macro level, as I show in the regressions presented below. The reason for this may be that as remittances are received, a small percentage of the amount remitted may be saved, which then becomes part of a large pool of capital for banks.

The remainder of the chapter is divided as follows. In part two, I review the literature on remittances and savings. There is not much about this aspect as the view has just started to emerge that remittances may have a positive impact on savings. In

[1] For example, Shivani Puri and Tineke Ritzema, present a paper titled "Migrant Worker Remittances, Micro-finance and the Informal Economy: Prospects and Issues," in which they state that while migrant remittances are important for development, they are usually not put to development issues but mostly consumption.

part three, I further elaborate on the two-period model presented in chapter one that can be used to analyze the impact of remittances on savings and investment in developing countries. The emphasis in this part of the model is on showing how remittances enhance national saving and investment (by way of small, pooled savings), and how remittances enhance a household's investment in education and in improving their standard of living in the home country. In addition, I explain how we can use the current account accounting to view the strong positive impact on national saving and investment in a particular country. In part four, I present the data and the empirical results as well as explain the results obtained. Finally, in the conclusion I summarize the results, and shortly offer some possibilities for future research, and also some policy implications.

2.2. The Literature on Remittances, Savings, and Investment

The literature that acknowledges the importance of remittances and calls for remittances to be used as a tool for development in general is vast. Among some of the papers that focus on remittances as sources of savings and investment in developing countries, the most thorough and groundbreaking is that of Jacques Bouhga-Hagbe, which I commented on in the introduction. Bouhga-Hagbe's model explains remittances to Morocco very well and begins to view remittances as a source of foreign exchange that could be used positively for development (Bouhga-Hagbe (2003). However, he does not focus on the impact on the aggregate level that remittances may have. He stays at the level of individuals making investment and construction decisions, and, like others, does not focus on how the billions of dollars that may come into a country may have an aggregate impact on the financial and investment decisions in the country.

I believe that if we look at remittances from the macroeconomic and financial perspective, we can consider the small savings of thousands of migrants in an economy as forming a large pool of savings that can be used for investment; this may also relax a household's budget constraints and lift some households out of poverty. Also, as stated before, the migrant family will make labor allocation and saving decisions that affect two countries. And these decisions sometimes do not have much to do with country performance or investment environments. Therefore, in many ways, remittances could be considered exogenous to country performance, or as exports and financial flows behave—they go through cycles linked to the business cycle and are subject to the vagaries of the exchange rate regimes, crises and other issues.[2]

While I am aware of papers (for example, Gruben and McLeod (1998), Mody and Murshid (2002), and Bosworth and Collins, (1999)) that have analyzed the impact on growth and development of financial flows like portfolio loans, foreign direct investment, loans, and even aid, I am not aware of any studies formally incorporating remittances in their econometric approaches. I do that in part four and present some interesting results.[3] The methodological approach is very simple, yet sometimes overlooked. The idea is that we can regress the savings and investment shares of GDP on the financial flows and include the variable "Remittances." Do remittances significantly affect the increase in savings and investment in a given country? The regressions in part four show that they do.

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[2] For example, Yang (April, 2005) has studied the impact of exchange rate shocks on changes in remittances.

[3] Riccardo Faini has not only included remittances in the growth equation, but has also tried to link them to school enrollment and other social variables. He does not present detailed data and modeling of his efforts, however. See, for example, his paper "Migration, Remittances, and Growth," presented at the United Nations' World Institute for Development Economics, 2002.

One attempt to connect remittances and savings is a paper by Richard Adams titled "Remittances, Household Expenditure and Investment in Guatemala," (2005). He shows that in Guatemala families who receive international remittances tend to save more and to invest more on education than families who do not receive remittances (Adams, 2005). This, then, helps us ask the question whether that is the case in general or just in Guatemala. I propose to analyze this by way of a pooled regression analysis of the 62 countries in my sample.

I use the overlapping generations model to look at the maximization of utility of the worker as he migrates to work and then returns home to retire. In addition, I estimate the impact of remittances on national saving rates, especially as I consider the overlapping generations model and see remittances partly as retirement savings by the migrant. The choice of the Tradables Nontradables model to help explain this setting is important for a simple reason: besides the fact that the worker can earn higher wages abroad, the worker can also return home to retire and spend the accumulated savings mostly on nontradables like housing, household help, healthcare, and leisure (all of which are cheaper in developing countries and thus the accumulated savings would go farther).

2.3. The Model and its implications

Labor costs in the nontradables sector are influenced by the productivity in the tradables sector. That is, in countries in which the tradables sector is more dynamic and more productive, the cost of labor in the nontradables sector will also be higher because the opportunity cost is higher. Simply and as I have stated in chapter 1, the price of nontradables is a multiple of the price of tradables, and the multiple depends on the productivity of the two sectors,

$$P_N = P_T(\frac{A_T}{A_N}) \qquad (2.1)$$

With all variables defined as in chapter one. This simply tells us that the higher price of tradables is due to the higher productivity of the tradables sector.

Since this formula clearly ties the returns to the inputs of production in the nontradables sector to the productivity of the tradables sector, we can see that, in a country in which the tradables sector is not dynamic, the returns to the inputs of production in the nontradable sector will be less because the productivity in the nontradables sector may be low and also because the productivity in the tradables sector may be.

Having determined the marginal product of labor and that the simple functional form of the real net earnings the worker would receive abroad at any time would be thus a function of the worker-migrant's marginal product of labor minus the costs of achieving an education and migrating, we may remember that the real wage would be:

$$w^* = A^* \alpha(1-\alpha)h^{\alpha-1} - \gamma$$

Notice again that, for now, the only difference in earnings is the TFP and the level of education the worker achieves. Remember also that so long as $(1-\alpha)(A_N^* - A_N) > M$ people will migrate north.

Now, using the two-period model, we can obtain the optimal savings or remittances. In the first period, young workers get an education, go to work abroad, and earn wages. They remit to their home countries a portion of those earnings to save them and thus have a retirement fund. In the second period, the worker returns home to live off the accumulated savings and the interest rate earnings of those savings. The worker will obtain higher wages abroad in the first part of her life but decides to retire in the home country, where the costs of nontradables are much lower. Thus, her accumulated savings during retirement will go farther. For example, during the first

part of her life, the worker experiences migration and education costs but during the second part of her life, the worker faces costs such as healthcare, housing, household help—all of which are nontradable. Thus, the maximization problem is:

$$\underset{h}{Max} V(c) = c_1 + \beta c_2$$

Where $c_1 = w_N^* L(1-\phi) - R$ and $R = \lambda[w_N^* L(1-\phi)]$ implying that

$c_1 = [1-\lambda] w_N^* L(1-\phi)$,

and $c_2 = (1+r)e[\lambda w_N^* L(1-\phi)]$.

Thus, the decision to be made is how much time to work, how much education to get, and how much savings to accumulate in the form of remittances sent.

Thus, we can here obtain an equation for remittances (which in this model are simply savings) and how these will be affected by interest rate and the subjective discount rate. We will see that the higher interest rates induce more saving but that also depends on the importance or subjective rate the person gives to future income. We will also see how the exchange rate influences the optimal savings but that this exchange rate depends on the different productivities.

Considering that $w_N^* L(1-\phi) = c_1 + \beta(1+r)e(1-\lambda)c_1$, we can isolate c_1 to see how much consumption in the first period there will be and how much saving to be sent back home there would be. Thus, solving for c_1, we obtain:

$$\frac{w_N^* L(1-\phi)}{1+\beta(1+r)e(1-\lambda)} = c_1 \qquad (2.2)$$

Which shows that the first period consumption depends on the wages earned (positively), on the exchange rate, and the interest rate (since λ is considered a parameter). Furthermore, from this we can see that the remittances sent back (the savings) also depends on the interest rate and the exchange rate. Notice, however, that

since λ is a parameter that is given, we are literally saying that the migrant assumes he or she will be sending a percentage of his or her earnings in spite of the amount of earnings. This essentially (like in the case of the relative risk aversion being one with logarithmic utility), tells us that the percentage of wage sent in the form of remittances does not directly depend on the interest rate even though the actual consumption does.

2.4. The Data and Statistical Testing of the Model

I use data from the *World Development Indicators* and from the *Global Development Finance* as the primary data source for the econometric analysis. I use the WDI data especially those pertaining to the shares of saving and investment. Data from the *Global Development Finance* is used to complement the data from the WDI and to have a better break down of the data on financial flows.

Furthermore, I use the series "Worker's Remittances" from the WDI to calculate our "remittances" variable (as share of PPP GDP). One difference between this and other studies is that the remittances series used, what the World Economic Outlook uses for example, are those from a newer definition which includes the lines from the Balance Of Payments Statistics "worker's remittances," "Compensation of Employees," and "Migrant's transfers." This obviously makes the numbers bigger, but not necessarily the changes from year to year. This new way of reporting "remittances" only started in April of last year in the WDI. I stayed with the old definition (using only the series "worker's remittances" from the WDI), as it seems like the more significant, stable, and source of migrant financing. I have computed the results using the newer definition as well and they do not vary in significant ways from the results I present here.

In addition, data from the *Penn World Tables*, version 6.1, is used to complement or to deflate the primary data. For example, to be able to get better estimates of the Purchasing Power Parity Gross Domestic Product of some countries, I use the PWT, to backcast some WDI Data, for example. Also, I use data from the *International Financial Statistics,* online version, to complement the primary data. For example, I use the Wholesale Price Index for the United States from the IFS to deflate remittances data. By doing this I am able to capture the actual value of what remittances can buy in another country—the tradable goods.

For the main results from the regressions, I use three-year averages for the period 1970-2003 whenever data is available. This allows thirty-four years of data to be averaged over 11 periods plus 2003. Having one period be a four-year average or simply keeping 2003 as one period does not change the results significantly. I have also calculated five- and ten- year averages to compare the results and see whether there are strong business cycles features (those results are not reported here). Using the twelve three-year period averages affords over 700 data points for each variable whenever available. Due to the lack of data in some of the variables, however, the number of available data points is sometimes halved, although not to the extent of making the results immaterial or useless. The results tables present the number of data points that where actually used to compute the calculations.

2.4.1. Empirical testing of the model

Allowing for some variables and some steady state solutions that cannot be estimated directly, I use several ways to estimate and highlight some of the variables in the model. This allows me to not only show the implications of the model but also to expand the model in some significant ways. Theoretically, the regressions take the form:

$$y_{it} = \alpha + \boldsymbol{\beta}' \mathbf{x}_{it} + \varepsilon_{it} \qquad (2.3)$$

Where α is the constant, $\boldsymbol{\beta}$ is a set of the coefficients to be estimated and $\mathbf{x}_{it}$ is the matrix of explanatory variables. If we are using a time-specific effect we can further modify the regression to be (for Example for period effects[4]:

$$y_{it} = \alpha_i + \gamma_t + \boldsymbol{\beta}' \mathbf{x}_{it} + \varepsilon_{it} \qquad (2.4)$$

Where γ_t is the time effect.

2.4.1.2. Basic Descriptive Statistics and Outlier Detections

Table Two presents summary descriptive statistics for Savings, Investment and the independent variables of interest. The Current Account is included for comparison purposes to see where the increased investment has come from. All the series shown are in percent of PPP GDP, except remittances and exports, which are deflated by a common import deflator while the current account is in percent of GDP. More detailed descriptive statistics can be found in appendix table A.1.1.

The saving and investment series behave differently from each other. An interesting aspect of these two series is that the share of investment remains larger than the share of savings. This, obviously, results in a current account deficit that has to be financed somehow. This financing can come from foreign savings (in the form of loans, portfolio investments, aid, or foreign direct investment) or from remittances, since remittances are part of the "unrequited transfers" line in the Balance of Payments. This is what the regressions will uncover—the source of financing for persistent current account deficits. Interestingly, table A.1.1 shows that the current account remains in deficit all throughout the three whole decades in the study, with some countries experiencing significantly large surpluses while others experiencing

[4] Wooldridge (2005) develops conditions for Average Treatment Effects for Random Effects formulations as well as for Fixed Effects.

significantly large deficits. Another fact to notice in the table is that both the saving and investment shares have increased over time, but there has been a lot of fluctuation in between. While the fluctuations have not been very large, the trend has been a slight increase in the shares of saving and investment.

Table 2 shows how remittances have become important for the developing countries in this study. While Remittances are significantly less than exports in term of the shares, they are certainly higher than aid and net FDI. In addition, remittances have increased through the periods of study. The only other series that shows a similar pattern is FDI, with FDI increasing in the late 1990s but decreasing slightly afterwards. Portfolio flows are not presented because they have remained significantly low, on average, for the countries in this study. Obviously, countries like Mexico, China, and India have experienced huge increases in FDI, but that seems to be the exception rather than the rule for most countries. Loans have not been a significant source of funds for some time also.

Table 2 Descriptive Statistics of Selected Variables

	Remittances [1]	Savings	Investment	Exports [1]	Aid	Net FDI	Current Account
Mean	1.98	7.36	9.47	11.01	1.14	0.90	-4.65
Median	0.86	6.42	8.14	7.84	0.46	0.43	-3.89
Maximum	43.19	38.23	38.62	46.75	21.98	13.98	15.30
Minimum	0.003	-6.31	1.43	0.80	0.002	-2.10	-34.76
Std. Dev.	3.56	5.47	5.47	9.03	1.87	1.50	6.46
Skewness	5.69	2.03	2.01	1.65	5.10	3.97	-1.27
Kurtosis	53.20	10.67	8.57	5.44	46.17	25.93	6.93
Observations	401	401	401	401	401	401	401
Countries	55	55	55	55	55	55	55

Sources: World Development Indicators 2005, Global Development Finance 2005, International Financial Statistics Online, Penn World Tables 6.1

[1] Exports and remittances were deflated by an import deflator as percent of real $PPP GDP.

2.4.2 The independent variables and the dependent variables: methodology

I present several regressions that link the dependent variables to the independent variables of interest. On this, I follow many authors and try to give an overall analysis

of the effect of the specific variables of interest and how they interact with other variables. In addition, I also show how the specifications change the significance and effect of the variables of interest. I present the results for the regressions using pooled Ordinary Least Squares or a modified specification of this method, like the Instrumental Variables/Two Stage Least Squares method. I also present results from the Generalized Least Squares method. I also use fixed effects for both the periods and the cross-section to see what happens to the fit of the regressions and the statistical significance of the variables. The results seem to improve in general as we use fixed country effects, but the period effects do not consistently appear significant.

2.4.3 The fitted regressions for Gross National Saving.

I move from a simple Ordinary Least squares sometimes with cross section weight and country and period effects to an Instrumental Variables estimation framework to review the consistency and unbiasedness of the estimated coefficients. Finally, I also use a Dynamic Paneling/Generalized Method of moment to further make sure the estimation results are reliable and consistent. Table 2.1 presents regression results using an Ordinary Least Squares regression with fixed period and country effects for cross-section heteroskedasticity and period differences. It also includes cross-section effects. Here I simply present results from using the variables contemporarily. Withholding for a moment any concerns regarding the robustness and unbiasedness of the results, the results are telling and interesting.

Obviously gross national saving is affected by exports (Equation 2.1.14). Apparently, experts and remittances are the only flows that affect gross national saving. However, this being an OLS setting, we cannot make too many significant conclusions about the relationships.

Table 2.1 The Determinants of Gross National Savings as a Share of GDP

Estimation Method:	Fixed Effects /1			
	Dependent Variable GNS: as % of PPP GDP			
	Eq. 2.1.11	**Eq. 2.1.12**	**Eq. 2.1.13**	**Eq. 2.1.14**
(White robust errors t-statistics)				
Remittances % of PPP GDP /2	**0.36** (5.3)	**0.27** (3.0)	**0.27** (3.1)	**0.23** (2.6)
Aid as % of PPP GDP	**0.63** (10.6)	**0.19** (0.5)	**0.19** (0.5)	**0.04** (0.1)
Interaction (Remittances*Aid)		**0.05** (1.6)	**0.05** (1.6)	**0.06** (2.4)
Net FDI flows % of PPP GDP			**-0.04** -(0.11)	**-0.08** -(0.22)
Exports % of PPP GDP /2				**0.35** (3.2)
Constant	**5.92** (47.4)	**6.41** (15.9)	**6.44** (10.8)	**2.75** (2.7)
Number of Countries	55	55	55	55
Numbers of Observations	401	401	401	401
Estimation Method	FE	FE	FE	FE
Fixed Effects Likelihood ratio F-test /3	10.9	8.7	7.9	6.3
Prob. Value (%)	0%	0%	0%	0%
Adjusted R-Squared	0.6	0.6	0.6	0.7
Mean of dependent Variable	7.4	7.4	7.4	7.4
St. Error of Regression	3.3	3.3	3.3	3.1

/1 Fixed country and period effects used in all regressions

/2 Exports and remittances were deflated by an import deflator as percent of real $PPP GDP. (source WDI and PWT 6.1)

3/ Likelihood ratio test for redundant "fixed" country and period effects

Adding an interaction term between remittances and Aid brings out an interesting fact: the combination of aid and remittances appears to be positive and significant, but the sign of Aid now becomes negative but not statistically significantly different from zero. One explanation for this may be that while aid and remittances improve savings, aid goes to the countries that tend to have less gross national saving. Adding net FDI (in equation 2.2.13) brings out an interesting issue. FDI negatively affects national saving but it is not statistically different from zero. Aid loses statistical significance as other flows are introduced.

Remittances seem to have a positive effect on national saving and that effect is not surprisingly larger than FDI considering that the graphs comparing the different kinds of flows show remittances to be larger in comparison to the other financial flows. This also may be because it is households who receive these small amounts of money and some of that amount is saved by households causing an aggregate saving that is much larger than expected. Notice in table 2.1 that remittances are not only positive but also statistically significantly different from zero by a good number. This however, will create a puzzle when other estimation methods are considered.

However, remittances (and certainly some of the other financial flows) may be considered either endogenous to country performance and may show correlation with other variables not present in the model. I am therefore presenting the correlations among the variables of interesting in Table A. 2 to determine whether we might have a lot of correlations among these variables. There seems to be some correlation among saving, investment and exports but not with remittances and other flows.

Yet, to avoid the fact that an error term in our regression may be correlated with another variable that is not included in the regression, we can introduce an instrumental variables setting. That is, while estimating the regression

$$y_{it} = \alpha + \boldsymbol{\beta}' \mathbf{x}_{it} + \varepsilon_{it} \quad (2.5)$$

We must aware that there might be some correlation in the error term and one variable in the matrix of explanatory variables $\mathbf{x}_{it}$ and so we must modify the regression equation a bit to allow for this correlation.

Table 2.2 presents regression results from using a Two Stage Leas Squares estimation method to estimate the determinants of Gross National Saving. Again, I move step-wise to notice the effect of adding variables to the basic equation. In addition, in all the regressions I have included the lagged exogenous variable and

instrumented remittances as the variable that may be affected by other variables not present in the model. I have also used an instrument for these exogenous variables to control for other unspecified effects. The way I developed the instruments is the following: I took the total of exports, remittances, aid, net FDI (separately) and considered a "group share" of the total remittances, exports, net FDI or aid received by the whole group over the group's total GDP. This shows that the group's share or the "global" instrument would be clearly correlated with the exogenous variable, especially remittances, but that the instrument is certainly exogenous to any individual country.

The results from using these instrumental variables to estimate the regression bring out a very interesting and somewhat puzzling fact: remittances seem not to affect gross national saving significantly. They remain positive but do not remain statistically significantly different from zero. In addition, even adding some items from the current account (like aid and Net FDI) does not change the significance of remittances in influencing saving. The only variable that consistently and significantly increases gross national savings is exports.

Surprisingly also, net FDI appears with a negative sign abut is not statistically different from zero. The sign for Aid changes sign depending on the specification but is never significant when interacted with Remittances or when introducing Net FDI, thus the robustness of its significance is called into question.

This may lead us to think that remittances do not really affect gross national saving. But we must be cautious in this conclusion as there may be other things going on. For example, some countries' national saving may depend more on Aid or other inflows instead of on remittances simply because the countries are too poor or their saving rate may not be affected by anything in the capital account.

Table 2.2 The Determinants of Gross National Savings as a Share of GDP

Method	**Two Staged Least Squares With Fixed Country and Period Effects**			
(t-statistics)	**Eq. 2.2.11** [/1]	**Eq. 2.2.12** [/1]	**Eq. 2.2.13** [/1]	**Eq. 2.2.14** [/1]
(White robust errors t-statistics)				
Remittances % of PPP GDP [/2]	**0.25** (1.1)	**0.26** (0.9)	**0.41** (1.0)	**0.15** (0.3)
Aid as % of PPP GDP	**0.68** (6.8)	**0.78** (0.3)	**1.97** (0.4)	**-0.41** -(0.1)
Interaction (Remittances*Aid)		**-0.01** -(0.3)	**-0.12** -(0.3)	**0.11** (0.3)
Net FDI flows % of PPP GDP			**-0.17** -(0.4)	**-0.23** -(0.6)
Exports % of PPP GDP [/2]				**0.40** (2.6)
Constant	**5.97** (18.4)	**4.92** (1.3)	**4.92** (1.3)	**2.77** (0.8)
Number of Countries	55	55	55	55
Number of Observations	341	341	341	341
Adjusted R-Squared	0.62	0.60	0.60	0.67
Mean of dependent Variable	3.1	3.2	3.2	2.9
St. Error of Regression	7.2	7.2	7.2	7.2

[/1] Instruments include lagged exports, aid and FDI plus world total for these flows and total world remittances all as a % of PPP GDP and as appropriate in each regression.

[/2] Exports and remittances were deflated by an import deflator as percent of real $PPP GDP.

(source WDI and PWT 6.1)

Having seen that savings is not affected by neither Remittances, Aid, nor net FDI, I lastly performed a Generalized Method of Moments estimation technique to see if a more sophisticated and with a "longer term" perspective estimation technique the results from the previous methods would be corroborated. In a Dynamic Panel/General Method of Moments model, the crucial aspect is that we allow lagged dependent variables to serve as explanatory variables thus:

$$y_{it} = \alpha_i + \mathbf{x}_{it}'\boldsymbol{\beta} + \delta\, y_{i,t-n}\varepsilon_{it} \qquad (2.6)$$

Here n is the number of lags of the dependent variable that we want to include in the regression.

Overall, the results from the GMM estimation confirm the fact that neither Remittances nor net FDI significantly affect gross national saving. However, surprisingly, Aid does significantly and positively affect gross national saving. Table 2.3 shows the estimation results from the GMM technique. The only variable shown to significantly increase savings is exports and, of course, lagged savings. Remittances generally enter with a positive sign but are not significantly different from zero. Net FDI is shown to have a positive but not significantly different from zero coefficient when not using the current account as an instrument.

Table 2.3 Determinants of Gross National Saving as a Share of PPP GDP

Dependent Variable: Gross National Saving as a share of PPP GDP GMM Arellano Bond Estimators and Period Fixed Effects				
(t-statistics)	**Eq. 2.3.11** [/1]	**Eq. 2.3.12** [/1]	**Eq. 2.3.13** [/1]	**Eq. 2.3.14** [/1]
(White robust errors t-statistics)				
Lagged Savings	**0.30**	**0.40**	**0.33**	**0.33**
(previous 3 yr period)	(2.1)	(3.3)	(10.8)	(10.6)
Remittances as % of Real PPP GDP [/2]	**0.07**	**-0.17**	**0.39**	**0.19**
	(0.3)	-(0.4)	(3.8)	(1.6)
Aid as % of PPP GDP		**0.73**	**0.43**	**0.49**
		(4.7)	(3.5)	(4.9)
FDI as a % of PPP GDP			**-0.15**	**-0.124**
			-(2.2)	-(1.62)
Exports as % of PPP GDP [/2]				**0.39**
				(14.87)
Number of Countries	54	54	54	54
Numbers of Observations	285	285	285	285
Sargan Test	0.97	0.99	0.710	0.775
Mean of dependent Variable	-0.3	-0.3	-0.3	-0.4
St. Error of Regression	3.2	3.2	3.1	2.9

[/1] Instruments include lagged exports, aid and FDI plus world total for these flows and total world remittances all as a % of PPP GDP and as appropriate in each regression.

[/2] Exports and remittances were deflated by an import deflator as percent of real $PPP GDP (source WDI and PWT 6.1).

In addition, the GMM method confirms an important result: that Aid seems to have a larger impact on saving than do remittances and even exports. The coefficient for Aid

is generally in the 0.4-0.5 range while that of remittances is never over 0.25 and that of exports is between 0.25-0.4. This is a surprising finding, considering that Aid has been seen in such a negative light and it has been blamed as one of the reasons poor countries may not save enough. It could be instead that those countries that receive aid are able to save a higher portion of income as aid frees some resources for consumption.

Does this mean that remittances as well as net FDI do not have any impact on gross national saving? I believe the answer can be found in a second channel where these variables may be affecting a developing economy—that of investment. If we consider the way in which remittances enter a country and what they do, we might get a better picture. Remittances are unrequited transfers that are sent by private parties in one country to private parties in another country. Generally, if these remittances are sent to not well-off individuals, they will mostly be used (as given by the marginal propensity to consume prevalent in that country and with that specific individual or household) and only a small fraction will be saved (also according to the Keynesian idea that saving is income minus consumption). Thus, the marginal propensity to save may not increase due to the increase in income, however, the level of saving may. Since the variable I have used for gross national saving is a percentage of PPP GDP, this percentage may increase or decrease over time and may not directly depend on remittances or FDI. This is what the regressions seem to be bringing to light. However, if the level of saving in a country increases, the available pool of financial sources may be used by investors to increase their investment in the country. Thus, the next logical step is to study the impact of remittances on investment.

I will do this and will also comment on the impact of Aid on investment. However, before turning to this aspect, I show some regression results from doing

robustness check on the previous regressions. I used 62 countries in my initial sample as I settled on it from the available countries with enough remittances data. However, generally there have been about 54 or 55 countries that were used for the estimation given the availability of all the data for all the variables. Perhaps the sample may be influencing the results or perhaps the sample used may contain countries that have volatility in either of the variables of interest.

To deal with this issue, I have reduced the sample to 37 countries available for the estimation. I mainly dropped countries that were small island states and countries that were former soviet republics. For the most part, small island states send many migrants abroad. And given that the former soviet republics still depend on Russia or the European Union for trade and investment, it seems logical that they would also send a lot of migrants to those areas. I present the results from using a different sample to estimate the relationship between gross national savings and the other variables.

These results are presented in table 2.4. Moving across the table, we can see that remittances seem to be statistically significantly different than zero in two of the estimation methods, but not in the GMM method. The coefficient becomes negative when the GMM estimation technique is used but is not statistically different from zero. Aid remains significantly different from zero across all three methods. While net FDI is negative in the IVs framework, it appears to be positive in the longer term as shown by the GMM methodology, although it remains statistically not significantly different from zero.

Table 2.4 The Determinants of Gross National Saving as a Share of PPP GDP in Selected Countries [1]

Dependent Variable: Gross national Saving as a share of PPP GDP						
Method	**OLS-FE [2]**		**2SLS-FE [3]**		**GMM [3]**	
	Eq. 2.4.11	**Eq. 2.4.12**	**Eq.2.4.21**	**Eq. 2.4.22**	**Eq. 2.4.31**	**Eq. 2.4.32**
(White robust errors t-statistics)						
Lagged Savings *(previous 3 yr period)*					**0.31** (6.3)	**0.34** (6.7)
Remittances as % of PPP GDP [4]	**0.99** (5.2)	**0.73** (6.2)	**1.15** (4.2)	**0.84** (5.4)	**-0.14** -(0.7)	**-0.18** -(0.8)
Aid as % of PPP GDP		**0.62** (8.5)		**0.62** (15.4)		**0.51** (2.7)
FDI as a % of PPP GDP		**0.10** (0.24)		**-0.12** -(0.29)		**0.20** (1.45)
Constant	**6.33** (23.5)	**6.10** (18.2)	**5.85** (14.3)	**5.90** (28.4)		
Number of Countries	37	37	37	37	37	37
Numbers of Observations	303	303	262	262	225	225
Adjusted R-Squared	0.66	0.67	0.66	0.68		
St. Error of Regression	3.27	3.19	2.97	2.87	2.90	2.86
Mean of dependent Variable	7.75	7.75	7.58	7.58	-0.42	-0.42
Fixed Effects Test [5]	12.11	10.66				
Degrees of Freedom	47	47				
prob values	0%	0%				
Sargan test					0.88	0.94

Notes:

[1] See Appendix A for the list of countries included.

[2] The Cross-section Fixed and Period Effects was used.

[3] Instruments included lagged Aid and FDI as well as the global shares of these plus remittances all as shares of PPP GDP.

[4] Remittances were deflated by an import deflator as percent of real $PPP GDP (source WDI and PWT 6.1).

[5] The Cross-section Fixed and Period Effects test reported is the F-Test. I reject the null of redundant fixed effects if all three tests do.

It would appear, then, that the initial sample of 62 countries may include countries for which the variables either fluctuate too much or there are not enough data points to make meaningful estimates. This second aspect may be shown by the fact that in the reduced sample all the countries are used in the estimation while in the larger sample, there are usually only 54 or 55 countries being used for the estimation. Considering a longer term, it also makes sense that the relationship between remittances and saving cannot be fully established for countries like the former soviet republics. Even though they may have a little over ten years of data, they data may not go far enough to allow for good estimation.

2.4.4. The fitted Regressions for Investment. Investment seems to be more significantly affected by remittances than saving, although that result also has to be seen cautiously. This may occur through a "chain" effect or indirect causality, where remittances are saved and then enter the pool of available capital from which businesses can borrow and utilize for investment projects. Table 2.5 shows the Ordinary Least squares results for the Investment regressions. A major question that arises when talking about investment is the role of savings and the current account, thus I have included the previous three-year average of the current account in this set of regressions.

I begin with the basic equation having the lagged current account and remittances. Not in all cases remittances appear positive and statistically different from zero, while FDI remain positive and statistically different from zero. Given that this is only a Pooled Ordinary Least Squares regression, I am not too concerned with the results. The Instrumental variables technique and the GMM method may further refine the results.

Given that I have already proven that some instruments may be needed to deal with some endogeneity issues. I ran another set of regressions with instrumental variables as I did for the savings regressions. The instruments for each variable are composed as I did for the savings regressions. Table 2.6 presents the result from the instrumental variables estimation. Unlike in the case of the savings regressions, remittances seem to be always positive and statistically significantly different from zero.

Table 2.5 Determinants of Investment as a Share of PPP GDP

Method	Dependent Variable: Investment share of PPP GDP Pooled Ordinary Least Squares With Fixed Effects					
(t-statistics)	Eq.2.5.11 /1	Eq.2.5.13 /1	Eq.2.5.14 /1	Eq.2.5.21 /1	Eq.2.5.22 /1	Eq.2.5.23 /1
(White robust errors t-statistics)						
Current Account	**-0.01**	**-0.02**	**-0.02**	**-0.04**	**-0.02**	**0.02**
(previous 3 yr period)	-(0.2)	-(0.5)	-(0.4)	-(0.8)	-(0.5)	(0.4)
Remittances as % of PPP GDP /2	**0.46**	**0.37**	**0.32**	**0.28**	**0.26**	**0.35**
	(2.2)	(2.0)	(1.6)	(1.6)	(1.4)	(2.2)
Aid as % of PPP GDP		**0.59**	**0.24**	**0.28**	**0.14**	**0.19**
		(4.4)	(0.8)	(1.0)	(0.5)	(0.7)
Interaction (Remittances*Aid)			**0.03**	**0.03**	**0.05**	**0.03**
			(1.1)	(1.3)	(2.0)	(1.6)
FDI as a % of PPP GDP				**0.78**	**0.73**	**0.65**
				(3.0)	(2.7)	(2.4)
Exports as % of PPP GDP /2					**0.22**	**0.19**
					(1.7)	(1.5)
Loans						**0.54**
						(3.7)
Portfolio Flows						**3.09**
						(2.2)
Constant	**8.39**	**7.86**	**8.21**	**7.39**	**5.24**	**4.98**
	(24.0)	(38.3)	(19.9)	(14.7)	(3.5)	(3.6)
Number of Countries	55	55	55	55	55	55
Numbers of Observations	370	370	370	370	370	370
Adjusted R-Squared	0.67	0.69	0.69	0.71	0.73	0.75
Mean of dependent Variable	9.3	9.3	9.3	9.3	9.3	9.3
St. Error of Regression	3.0	2.9	2.9	2.8	2.7	2.6
Fixed Effects Test /3	10.50	11.33	10.05	8.20	6.61	5.90
Degrees of Freedom	64	64	64	64	64	64
prob values	0%	0%	0%	0%	0%	0%

/1 With Fixed Country and Period Effects

/2 Exports and remittances were deflated by an import deflator as percent of real $PPP GDP (source WDI and PWT 6.1).

/3 The Cross-section Fixed and Period Effects test reported is the F-Test. I reject the null of redundant fixed effects if all three tests do.

The significance of exports, however, is lost. This would make sense given that generally an increase in exports means an increase in contemporary investment and so the presence of the previous period savings would make the need for investment due to higher exports less. Aid appears positive but not always significantly different from zero. Net FDI appears with the correct sign and significance (equation 2.6.13).

Table 2.6 Determinants of Investment as a Share of PPP GDP

	Dependent Variable: Investment share of PPP GDP				
Method (FE: fixed effects) [1]	2SLS-FE	2SLS-FE	2SLS-FE	2SLS-FE	2SLS-FE
(t-statistics)	**Eq. 2.6.11**	**Eq. 2.6.12**	**Eq. 2.6.13**	**Eq. 2.6.14**	**2.6.15**
(White robust errors t-statistics)					
Current Account	**0.14**	**1.08**	**-0.07**	**0.09**	**0.09**
(previous 3 yr period)	(3.1)	(5.5)	-(0.4)	(1.8)	(1.9)
Remittances % of PPP GDP [2]	**1.19**	**0.12**	**0.89**	**0.80**	**0.83**
	(5.5)	(2.9)	(5.7)	(4.7)	(5.2)
Aid as % of PPP GDP		**0.44**	**0.49**	**0.48**	**0.46**
		(4.6)	(4.2)	(5.1)	(5.2)
Net FDI flows % of PPP GDP			**0.81**	**0.73**	**0.74**
			(2.4)	(2.9)	(3.0)
Exports % of PPP GDP [2]				**-0.02**	**-0.02**
				-(0.5)	-(0.4)
Portfolio Flows					**3.24**
					(1.7)
Constant	**7.56**	**7.24**	**5.84**	**7.11**	**6.96**
	(13.1)	(14.1)	(5.2)	(9.9)	(10.5)
Number of Countries	55	55	55	55	55
Numbers of Observations	309	309	305	309	309
Adjusted R-Squared	0.74	0.75	0.76	0.77	0.78
Mean of dependent Variable	9.1	9.1	9.1	9.1	9.1
St. Error of Regression	2.5	2.5	2.5	2.4	2.4

[1] Country and period fixed effects.

[2] Exports and remittances were deflated by an import deflator as percent of real $PPP GDP (source WDI and PWT 6.1).

[3] Instruments include lagged exports, aid, FDI, Portfolio Flows, and savings plus world total for these flows and total world remittances all as a % of PPP GDP where appropriate.

Having shown the positive and statistically significant effect of remittances on investment, we can see if the GMM technique confirms the positive findings so far. Table 2.7 shows the regression results from using the GMM method. The results in the table seem to confirm the previous findings. Remittances seem to be positive and significant in every regression except when we add other kinds of capital flows. However, the signs and the statistical significance of exports and remittances appear to be wrong. The results of this regression are a good beginning for further research in terms of the econometric theory and economic analysis.

Table 2.7 Determinants of Investment as a Share of PPP GDP

Dependent Variable:	**Investment share of PPP GDP**			
Method:	**GMM Arellano Bond Estimators** [/1]			
	Eq. 2.7.11 [/2]	**Eq. 2.7.12** [/2]	**Eq. 2.7.13** [/2]	**Eq. 2.7.14** [/2]
(White robust errors t-statistics)				
Lagged Investment	**0.65**	**0.53**	**0.33**	**0.37**
(previous 3 yr period)	(36.2)	(31.8)	(5.1)	(7.1)
Remittances as % of Real PPP GDP [/3]	**0.43**	**0.26**	**0.08**	**0.01**
	(5.6)	(4.6)	(0.5)	(0.1)
Aid as % of PPP GDP		**0.14**	**0.49**	**0.50**
		(2.3)	(6.3)	(7.2)
FDI as a % of PPP GDP			**0.92**	**0.79**
			(6.5)	(6.4)
Exports as % of PPP GDP [/3]				**-0.03**
				-(1.0)
Number of Countries	55	55	55	55
Numbers of Observations	340	340	340	331
Sargan Test	0.84	0.96	0.999	0.95
Mean of dependent Variable	-0.4	-0.4	-0.4	-0.4
St. Error of Regression	3.2	3.1	2.7	2.7

[/1] With period fixed effects and differencing.

[/2] Instruments include lagged exports, aid and FDI plus world total for these flows and total world remittances all as a % of PPP GDP.

[/3]Exports and remittances were deflated by an import deflator as percent of real $PPP GDP (source WDI and PWT 6.1).

Given the somewhat positive results from the three estimation techniques considered, the robustness check will be crucial for the further increase of our confidence in the results. I do this with the same 37 countries I used in the savings regressions. I do this to keep consistency and because the logic of staying with the countries in the smaller sample also makes sense here. Table 2.8 presents the results from this robustness check. It is interesting that in the case of investment, the opposite from what happened with the savings regressions happens.

The OLS regressions show remittances to be positive and statistically significantly different from zero as they affect investment. Aid also is positive and statistically significantly different from zero, while the results for net FDI vary. The

instrumental variables results show remittances to be mostly positive and statistically significantly different from zero while the sign and significance for aid switches. The results for Net FDI are also not consistent throughout. However, when we use the GMM method, remittances become statistically insignificantly different from zero while remaining positive. Aid is consistently positive but not statistically different from zero and net FDI is both positive and statistically different from zero. This overall result makes sense when we again view remittances in the long term and see that remittances may affect savings more directly and investment more indirectly while in the long-run the flow of remittances into savings and these into investment would make remittances not as important for investment.

2.5. Conclusion and Final Remarks

I have presented major reasons why studying the impact of remittances in developing countries is important and why it is so especially in countries that have a high share of remittances on GDP. The literature on Remittances is full of stories on mainly the negative consumption impact that workers' remittances have on the economy of the recipient country. However, that literature is based more on stories and non-rigorous studies regarding what people in individual villages or countries do with the money they receive.

Table 2.8 Determinants of Investment as a Share of PPP GDP in Selected Countries [1/]

Method	Dependent Variable: Investment share of PPP GDP					
	OLS-FE [2]		2SLS-FE		GMM	
	Eq. 2.8.11	Eq. 2.8.12	Eq. 2.8.21 [3]	Eq. 2.8.22 [3]	Eq. 2.8.31 [4]	Eq. 2.8.32 [4]
(White robust errors t-statistics)						
Current Account	**0.04**	**0.04**	**0.10**	**0.10**		
(previous 3 yr period)	(0.4)	(0.4)	(1.5)	(1.4)		
Lagged Investment					**0.46**	**0.63**
(previous 3 yr period)					(10.2)	(23.4)
Remittances as % of PPP GDP [5]	**1.01**	**0.97**	**2.17**	**1.91**	**0.75**	**0.04**
	(9.7)	(8.3)	(2.4)	(2.6)	(3.4)	(0.3)
Aid as % of PPP GDP	**0.53**	**0.53**	**0.27**	**0.32**	**0.42**	**0.38**
	(4.7)	(4.6)	(1.3)	(1.8)	(10.1)	(2.5)
FDI as a % of PPP GDP		**0.20**		**0.10**		**0.92**
		(0.6)		(0.1)		(8.6)
Constant	**7.24**	**7.12**	**5.65**	**5.97**		
	(23.7)	(21.4)	(4.1)	(5.3)		
Number of Countries	37	37	37	37	37	37
Numbers of Observations	284	284	261	261	263	263
Adjusted R-Squared	0.72	0.72	0.72	0.74		
St. Error of Regression	2.74	2.74	2.54	2.45	2.69	2.78
Mean of dependent Variable	9.02	9.02	8.81	8.81	-0.41	-0.41
Fixed Effects Test [7]	13.42	10.56				
Degrees of Freedom	46	46				
prob values	0%	0%				
Sargan test					0.97	0.88

[1] See Appendix A to see the list of counries included.

[2] The Cross-section Fixed and Period Effects was used.

[3] Instruments included lagged Exports, Aid and FDI as well as the global shares of these plus remittances all as shares of PPP GDP.

[4] Instruments included lagged Exports, Aid and FDI as well as the global shares of these plus remittances all as shares of PPP GDP.

[5] Remittances were deflated by an import deflator as percent of real $PPP GDP (source WDI and PWT 6.1).

[6] The Cross-section Fixed and Period Effects test reported is the F-Test. I reject the null of redundant fixed effects if all three tests do.

The existing literature that uses rigorous econometric studies to analyze the impact of remittances has not gone far enough in fully studying the impact of remittances. Thus, the analysis has usually tended to also emphasize the negative impact of remittances by using models that emphasize the portfolio approach to remittances, the altruistic approach, or some kind of moral hazard. Until April of last year--when the International Monetary Fund included a section on Remittances in its World Economic Outlook-- few studies had focused on the positive aspect of remittances. Moreover, the few that had, had focused only on specific countries.

I have used three-year averages for these countries since 1970 until 2003 and have presented the results from applying econometric analysis to the data. The results have been interesting. The impact of remittances seems to be in general positive and important, especially to the saving and investment behaviors of households and of the entire economy.

The analysis suggests some other areas of research regarding remittances. Utilizing another kind of mathematical model may highlight other issues that I have not touched upon. Using other variables that may more directly show the influence of remittances may also yield some results. Offering saving and investment incentives to those remitting is another way in which countries can enhance the developmental impact of remittances in developing countries.

REMITTANCES AND SCHOOL ENROLLMENT

3.1. Introduction

Much has been written regarding the effects of migration on poor countries. The literature on the "Brain Drain" due to the emigration of skilled workers from developing countries to the developed countries has a long history. More recently the World Bank, for example, has published a book on migration and remittances in which mostly the effect of migration is seen as a brain drain. There has also been a school of thought (mostly since Stark 1967) that views migration (and remittances) as a "blessing in disguise" for developing countries. And more recently Stark and others have said that there can be a gain with a drain, using data from rural Mexico (Boucher Stark, and Taylor, 2005). Using a two-period model aided by a Tradables and Nontradables model in which migration is seen as bridging a gap in wages, this chapter studies a sample of 62 developing countries and analyzes the impact of remittances on educational achievement. In this sense, the chapter emphasizes the positive effect that migration can have not only by offering incentives to future migrants to obtain more human capital but by also showing how remittances (what

migrants send back to their home countries) positively affect school enrollment in developing countries.

In the empirical investigation, the chapter takes a macroeconomic approach using some variables that have been used by microeconomic-based studies to analyze the determinants of school enrollment, especially the level of schooling of the female parent and government education expenditures. The chapter concludes that the prospects of migration can serve as an incentive to attain higher human capital and that remittances are an example of those incentives while also serving to fund of that attainment. That is, remittances are not only the result of migration (the "returns" to human capital) but also the necessary tool to expand the income constraint of households to spend on education.

The chapter is organized as follows. In the second part of the chapter, I review the latest literature on the brain drain discussion. The discussion seems to be shifting to a more positive view of migration and remittances due to globalization and the new possibilities afforded by globalization on the prospects of labor migration. However, there is no consensus regarding the policy implications of that view of migration, especially when the discussion focuses on highly skilled migration. In the third part, I further elaborate on the model I presented in chapter one and try to explain why people of any skill level migrate in this era of globalization. The answer can be found mostly in the productivity differences among countries. This, of course, is seen in the wage differential among countries. But the model explains that even for workers of the same skill, migration presents an opportunity for earning higher wages abroad. In the fourth part of the chapter, I present the data and the statistical results. The results show that remittances positively influence primary and secondary school enrollment in developing countries. But the results are much less clear for tertiary school

enrollment. As I stated above, remittances can be seen as an incentive due to expected returns from migration or as an increase in family income that give households an opportunity to invest in more human capital. The argument can be made then, that even when skilled individuals migrate, there is still a benefit accruing to the home country (and its residents) in the form of increased human capital in the long term. In the conclusion, I briefly offer some final remarks and some policy implications that can be gleaned from the statistical results and the model.

3.2. The Literature on the Brain Drain

The most recent work framing the brain drain discussion is the book published by the World Bank titled *International Migration, Remittances and the Brain Drain* (World Bank, 2005). In one of the chapters in it, Frederic Docquier and Abdeslam Marfouk argue that the proportion of high skilled migrants from poor countries to rich countries is overwhelmingly higher than those with low skills. They argue that the net loss to poorer countries is seen in the fact that these migrants represent a higher proportion of skilled workers in the developing world and thus the countries from where these workers migrate are left with fewer skilled workers overall. This would imply that the average level of human capital in these countries then is decreased (Docquier and Marfouk, 2006). In general too, the argument is made that by having immigration policies that favor the skilled workers, rich countries are benefiting from the education that these workers receive in their home countries, costs that are mainly borne by the governments of those countries.[1]

This line of reasoning makes sense when considered from a time invariant perspective. That is, by doing a bit of static math, one sees there is a high proportion of skilled migrants leaving the developing world. Yet, if we consider these

[1] *The Economist,* in its November 3rd, 2005 edition's article "Fruit that falls far from the tree," presents the arguments in a readable fashion.

proportions over time, the picture might look different. Furthermore, the fact that the average level of human capital in developing countries might be increasing would tell us that the proportion of low skilled workers is decreasing. This may be due to emigration or more directly the result of increased educational attainment.

The brain drain discussion is tightly linked to the discussion of remittances. Remittances too are seen as either a help or a hindrance to growth for developing countries. This point is what Oded Stark and Yong Wang emphasize and expand upon, in their article "Inducing Human Capital Formation: Migration as a Substitute for Subsidies," when trying to show that the very prospects of migration (and thus earning higher wages abroad) can serve as incentives for workers to obtain a higher level of human capital (Stark and Wang, 2001). Alejandra Cox Edwards and Manuelita Ureta, using survey data from El Salvador, have shown that remittances from abroad positively influence households' schooling decisions (Cox and Ureta, 2003). This suggests that households expect higher earnings from higher education. It also suggests that once credit constraints are relaxed households tend to spend more on education.

3.3. A Simple Version of a Model of Human Capital Formation

As I have demonstrated previously, the entire issue for a worker who faces migration prospects, when making migration decisions, hinges on the maximization of the net earnings the worker will achieve, whether the worker expects to find a job in the tradables or the nontradables sectors of the economy.

Recalling the basic set-up of the model in chapter one and the equations presented here again for ease of flow (and also keeping those equation numbers), the home country faces the following production function:

$$PQ = AH^{\alpha}L^{1-\alpha} \quad (1.1)$$

In this case, the value of the worker's Marginal Product of labor is:

$$PA(1-\alpha)\frac{H^{\alpha}}{L^{\alpha}} = PA(1-\alpha)h^{\alpha} = \psi \quad (1.2)$$

Which is the return to human capital investment if the worker stays in the home country. And in the case of the values of the output, and returns to factors of production, it will be the difference in exchange rates that are not explained that will give rise to a certain "arbitrage" migrants from whichever education level take advantage of. This last point can be more clearly seen when we consider the actual wages the migrant worker can receive at home and abroad.

The real wage for the worker in the home country in this setting is simply equal to the marginal product of labor minus the costs of obtaining an education (where these costs are linear with the years of schooling). And since the worker wants to maximize his net earnings, the worker's maximization problem gives us the net wages of the worker:

$$w_h = A\alpha(1-\alpha)h^{\alpha-1} - \gamma \qquad (1.3)$$

And solving for h:

$$\tilde{h} = \left(\frac{A\alpha(1-\alpha)}{\gamma}\right)^{\frac{1}{1-\alpha}}$$

Which would be the amount of education that will maximize the worker's earnings if he or she stays in the home country. Notice again that the higher the productivity in the home country, the higher the amount of education the worker will decide to achieve.

However, the worker (again, especially the non-tradable service sector worker) realizes that, by migrating, the worker can face another production

function—that of the recipient country, where the worker's value of the marginal product of the worker's labor is, in the recipient country:

$$P^* A^* (1-\alpha)\frac{H^\alpha}{L^\alpha} = P^* A^* (1-\alpha)h^\alpha = \psi^* \quad (1.4)$$

Recall that the only difference between the home-country production function and the recipient-country (abroad) production function in terms of actual or real output is the different TFPs (A and A^*). This would explain why a worker with only a primary or elementary education level has better opportunities to earn a higher income in a country with a higher TFP, just as a doctor with a much higher education level has an opportunity to earn a higher income in the same country with that higher TFP. We will add to this difference the "unexplained" difference in purchasing powers even when accounting for the exchange rates via the difference the prices of these same services because of the productivity in the tradables sector in each country.

If the worker decides to migrate, the worker will face some migration costs, M, and thus the real wages in the recipient country have to account for that as well. Assuming that markets always clear, the marginal productivity of labor equals the wage. The simple functional form of the real wage rate the worker would receive at any time would be thus a function mainly of the worker-migrant's marginal product of labor minus the costs of migrating:

$$w^* = A^* (1-\alpha)h^\alpha - \gamma h - rM \quad (1.5)$$

Notice that, for now, the only difference in earnings is the TFP and the level of education the worker achieves. Therefore, the same worker now faces an h that depends on the productivity:

$$\hat{h} = \left(\frac{A^* \alpha(1-\alpha)}{\gamma}\right)^{\frac{1}{1-\alpha}} \quad (1.6)$$

So, since the return to human capital investment is now given by equation (1.4) while the net earnings are given by equation (1.5) and since A^* is assumed to be greater than A, migrating is a desirable option for people of any skill level.

And we have said that this is the case whenever $w^* - w > rM$ or, more specifically, $(1-\alpha)(A^* - A) > rM$. Notice that in this setting the worker simply has a choice in terms of the maximization of h and this he can do taking either A^* or A as given. Clearly, the higher the returns to h because of the productivities involved the more there will be an incentive to achieve more education. And if the worker maximizes h assuming A^*, the worker will choose a higher educational achievement.

That is, equation (1.4) is the equation that the migrant takes as given to makes his or her decisions regarding the investment in human capital even in terms of the foreign productivity (especially if the migrant intends to migrate after graduating from school).

And so people move north. . .

Once the worker migrates, and begins working, the worker sends some of that salary back home:

$$R = \lambda w^*(h)$$

Now, using a two-period model, we can describe how the worker decides obtain an education, save, and send money back home. Thus, the maximization problem is:

$$\underset{h}{Max} V(c) = c_1 + \beta c_2$$

Where $c_1 = w_N^* L(1-\phi) - R$ and $R = \lambda[w_N^* L(1-\phi)]$ implying

that $c_1 = [1-\lambda] w_N^* L(1-\phi)$,[2]

[2] We do not need to explicitly state migration and education costs, as they are already included in w^*, the real wages abroad or in the recipient country.

and $c_2 = (1+r)e[\lambda w_N^* L(1-\phi) - \mu F]$.[3]

In the first period, young workers get an education, go to work abroad and earn wages. They remit to their home countries a portion of those earnings to save them and thus have a retirement fund. In the second period, the worker returns home to live off the accumulated savings and the interest rate earnings of those savings. Thus, the decision to be made is how much time to work and how much education to get. Therefore, solving for the maximization problem and finding the amount of h that will maximize lifetime utility we have:

$$\bar{h} = \left(\frac{A^* \alpha(1-\alpha)(1-\lambda)}{\gamma[(1-\lambda) + e\beta(1+r)\lambda]} \right)^{\frac{1}{1-\alpha}} \qquad (1.8)$$

Several things are worth noting here. Notice that maximizing h to maximize lifetime utility simply adds some more terms to $\hat{h}$. But the basic issues remain, $\bar{h}$ is positively related to A^*, the foreign productivity; in addition, now that we are accounting for period two and for the exchange rate, we see that the amount of education also depends (negatively)on the exchange rate, the interest rate and the discount rate. The higher the interest rate, the less the worker feels the need to achieve a higher level of education, for example. Notice also that substituting the exchange rate for the difference in productivities in equation (1.8) we have a formula for education that depends on the parameters in the model:

$$\bar{h} = \left(\frac{A^* \alpha(1-\alpha)(1-\lambda)}{\gamma[(1-\lambda) + \frac{A}{A^*}\beta(1+r)\lambda]} \right)^{\frac{1}{1-\alpha}} \qquad (1.9)$$

[3] Literally, the workers' remittances are what become the worker's savings in the home country, while a portion of those savings can be given to relatives as goodwill gifts or saving's management costs. Also, the worker does not have to necessarily work in the nontradables sector abroad. I model the decision in this way simply to emphasize that anybody can migrate, not just skilled labor.

The model can be extended in several ways. For example, we could add children to the utility function. This would show an influence on the migrant's childbearing and schooling decisions. For now, I have chosen to present the simplest model so as to be able to fix ideas as to how remittances could influence education decisions.

3.4. Data and Methodology

For the estimation of this simple model of migration, I do add other variables that influence peoples' decisions regarding schooling. This controls for spurious results and adds more insights into the relationship between remittances and other variables. I use data from the *World Development Indicators, EdStats*, and from the *Global Development Finance* (all online) as the primary data sources for the econometric analysis. I use the WDI data especially those pertaining to gross domestic product, per capita income, and remittances. The indicators of primary, secondary, and tertiary school enrollment come from *EdStats* as does the indicator on the adult female literacy rate. Data from the *Global Development Finance* is used to complement the data from the WDI and to have a better break down of the data on financial flows. I distinguish among the sources for the variables used whenever that is necessary.

In addition, data from the *Penn World Tables*, version 6.1, is used to complement or to deflate the primary data. For example, to be able to get better estimates of the Purchasing Power Parity Gross Domestic Product of some countries, I use the PWT. Also, I use data from the *International Financial Statistics,* online version, to complement the primary data. For example, I use the Wholesale Price Index for the United States from the IFS to deflate remittances data. By doing this I am able to capture the actual value of what remittances can buy in another country—the tradable goods.

For the results from the regressions, I use five year averages for the period 1970-2003 whenever data is available. This allows thirty four years of data to be averaged over seven periods, with one period containing data for the last four years. Using the seven five-year period averages affords over 430 data points for each variable whenever available. Due to the lack of data in some of the variables, however, the number of available data points is reduced considerably, although not to the extent of making the results immaterial or useless. To avoid losing explanatory power in some of the estimation methods, I used three-year averages to check on the robustness of the results. Only when the results differ significantly or are in conflict with the five-year averages do I report them in the main body of the chapter. Appendix A contains two tables reporting estimation results with three-year averages. In all cases, the results tables present the number of data points that where actually used to compute the calculations.

3.4.1. Basic Descriptive Statistics and Outlier Detections

Since it is the achievement of human capital that is of utmost interest, I begin the data analysis with enrollment rates. Table three presents the 5 year period averages for gross enrollment rates by percentages in the sample. There are several interesting things to note in those statistics. Every level of education has experienced an increase since 1970. Obviously the sample of countries in this study is very varied and that shows in the table when we look at the smallest and largest rates of enrollment. The diversity of education systems and quality as well as the overall economic diversity in developing countries is seen by the fact that many countries have achieved enrollment rates in the primary and secondary levels of over 100 per cent of the cohort rates. Other countries are still struggling to reach even 10 percent and 50 percent gross enrollment rates at the secondary and primary levels, respectively.

While tertiary schooling has increased, the disparity among countries is also striking. The average among countries is still low, but some countries have achieved very remarkable rates in the high fifties while others have not reached even 5 per cent rates.

What causes such disparities? More importantly, rates have been increasing throughout the years, as they should be. Are remittances a very important cause of these increases? Certainly the status of women, as indicated by the adult female literacy rates, would be a direct cause. Microeconomics-based studies used parental schooling as one of the variables that influences child schooling. Given the lack of such data at the macro level, I rather use the adult female literacy rates. In addition, it is well known that in developing countries the more literate the mother the healthier and the more educated the children will be.

Table 3. Gross School Enrollment

Gross Primary Enrollment as percent of cohort					
5 year avera	Mean	Median	St. Dev.	Minimum	Maximum
1	80.8	90.5	29.3	39.3	102.9
2	78.7	83.2	28.1	15.5	109.9
3	84.8	90.0	28.3	21.0	120.9
4	85.9	96.3	25.5	24.9	116.1
5	94.0	99.6	22.0	31.3	121.7
6	99.3	100.4	18.4	46.7	131.0
7	107.7	108.8	15.6	57.5	147.8

Gross Secondary Enrollment as percent of cohort					
5 year avera	Mean	Median	St. Dev.	Minimum	Maximum
1	18.7	18.7	9.6	9.8	27.7
2	28.6	23.6	17.0	2.2	57.9
3	34.7	31.4	18.6	3.3	73.5
4	37.9	38.1	19.8	5.3	80.7
5	44.9	45.7	20.9	7.8	90.6
6	52.8	55.4	22.0	12.7	99.3
7	69.1	75.9	22.9	18.7	108.8

Gross Tertiary Enrollment as % of Cohort					
5 year avera	Mean	Median	St. Dev.	Minimum	Maximum
1	3.6	3.3	3.0	0.7	7.3
2	5.3	4.1	4.9	0.3	19.3
3	7.7	5.5	6.5	0.4	24.6
4	8.7	6.7	7.0	0.6	26.0
5	11.3	9.2	9.0	0.8	37.2
6	13.9	11.8	10.4	1.0	42.2
7	21.6	20.1	13.8	1.9	58.1

Source: Source: EdStats Online

/1 The 5 year avearage period start in 1970 and end in 2003 in this study.

Table 4 presents basic descriptive statistics for some of these variables. Adult female literacy has increased since 1970. I also include the share of public expenditures in education as a percent of GDP in the model to control for the government's efforts to increase enrollment at all levels. The numbers here show that the share of public expenditures on education have been somewhat constant or have risen slightly in the past three decades. This has a very important implication in the sense that if the government has not increased investment in education (but still may

have increased its quality), there necessarily have to be other things that have affected the increases in school enrollments. An interesting pattern will arise in the statistical analysis where we will see that remittances have a much larger effect on schooling than public expenditures. This will give some validity to Stark and Wang's claim that remittances can act as substitutes for public subsidies for schooling.

Regarding the role of the returns to education (in the form of the wages migrants can earn abroad) and other financial flows that may affect education levels; I use remittances as one of the other variables that may affect education. Table 4 also shows selected descriptive statistics of these variables in three-year period averages. Remittances have been increasing as a share of Real PPP GDP.

3.4.2. Empirical testing of the model

I use several ways to estimate and highlight the variables in the model. This allows me to not only show the implications of the model but also to expand the model in some significant ways. I focus the discussion on three different aspects that bear on school enrollments: the role of the status of women, the role of public expenditures, and the role of remittances. I also add exports, aid, and net FDI for comparison purposes and to see if any of these variables necessarily comprise a basic model of aggregate school enrollment in a country. The regressions take the form of equation **2.4** from the previous chapter where the dependent variable is the log of the respective school enrollment level and the matrix of explanatory variables contains exports, remittances, aid, and net FDI as explained in chapter two also.

Table 4. Selected Determinants of School Enrollment

Adult Female Literacy

5 year aver	Mean	Median	St. Dev.	Minimum	Maximum
1	40.7	39.0	36.6	7.3	77.7
2	38.8	23.1	31.2	3.5	91.1
3	45.2	29.1	29.8	4.9	93.3
4	49.5	42.1	27.9	6.7	94.9
5	60.1	68.9	28.8	9.0	99.4
6	67.8	74.8	26.6	14.1	99.6
7	73.7	83.8	25.5	11.9	99.7

Public Education Expenditures as Percent of Public Budget

5 year aver	Mean	Median	St. Dev.	Minimum	Maximum
1	2.8	2.7	0.7	2.0	3.7
2	5.1	3.4	7.3	0.9	33.4
3	4.9	3.2	6.6	1.2	34.3
4	3.9	3.0	3.4	1.1	18.6
5	3.7	3.4	1.7	0.7	7.4
6	4.0	3.8	1.6	0.6	9.1
7	4.8	4.4	2.0	1.8	10.2

Remittances as Percent of Real PPP GDP

5 year aver	Mean	Median	St. Dev.	Minimum	Maximum
1	0.20	0.18	0.16	0.03	0.42
2	1.53	0.31	2.92	0.01	11.82
3	1.46	0.58	2.62	0.005	12.07
4	1.39	0.81	1.88	0.01	9.16
5	1.79	0.87	2.84	0.01	15.60
6	1.79	1.05	2.55	0.01	12.61
7	2.19	1.07	2.81	0.04	10.42

Sources: EdStats Online, WDI Online, PWT 6.1

[1] The 5 year avearage period start in 1970 and end in 2003 in this study.

3.4.2.1. The role of women

Numerous studies have highlighted the fact that there is a direct relationship between the improvement of women's status and the educational and health achievements of households in poor countries. This is borne clearly in the regressions I present. For example, in all the regressions, adult female literacy (used as a proxy for female parental schooling) is statistically differently from zero for primary school enrollment. However, that effect disappears during secondary enrollment. This accords well with

the micro-based literature that explains that by the time the child enrolls in secondary schooling, the child's educational experience influences the enrollment more than parental schooling.

Table 3.1 shows the regression results from using an Ordinary Least Squares estimation. All the regressions included (not reported for brevity) a measure of Real Gross Domestic Product to control for economic activity and income. Fixed cross-country and period effects were used to control for some unobserved country effects.

While I will not focus on tertiary schooling, I do present some results for this level of education. For tertiary schooling, the estimation techniques become more complicated and even so do not give clear results for a neat story. I began by using random effects in all the specifications for every level of schooling. For primary and secondary schooling, the coefficient estimates were all better estimated using fixed country effects, they all had the expected signs and were statistically significantly different from zero. In every case I used random effects, I could reject the null that there was no misspecification. As I moved to fixed country effects, I could reject the null that the effects were redundant. And so the estimated coefficients had been robust to specifications and were important for our study. The same cannot be said of tertiary schooling. Regressing the log of the gross tertiary enrollment rate on a step-wise basis on the variables of interest did not always provide a clear picture of the determinants of tertiary schooling. I could reject the null hypothesis that there was no misspecification when using random effects. However, when running the specification that there were fixed effects, I could also reject the null that the effects were redundant. The problem arose in the signs and the statistical significance of the estimated coefficients. Table 3.1 shows the very last of the steps to estimate the regression for tertiary schooling (equations 3.1.31). Initially, adult female literacy has

the right sign and significance. But once public expenditures on education is introduced, it enters with the wrong sign. That would be ok initially because it is not statistically significantly from zero. But, once the remittances variable is introduced, that variable also enters the regression with a negative sign but is statistically insignificantly different from zero. However, adult female literacy also becomes negative and looses any explanatory power. That still would be correct considering that by the time a student reaches tertiary education, his or her enrollment will depend more on his or her own abilities and not parental achievement. However, the problem remains with the role of public expenditures and remittances.

The better part of the story is given by the regressions regarding primary and secondary school enrollment. Primary school enrollment seems to be positively and statistically significantly affect by adult female literacy rates serving as a proxy for mother's educational achievement. Secondary school enrollment also seems positively and statistically significantly affected by adult female literacy. Adding other variables of interest does not affect the sign and significance of the adult female literacy variable. Table 3.1 shows the previous five year average of the dependent variable as an explanatory variable. This simply achieves better estimation and it is logical in this kind of studies to always account for the previous period measure of the dependent variable. However, since there may be theoretical statistical issue with it, I will present a modified version of the basic regression with a lagged dependent variable once I move to more sophisticated estimation methods.

Table 3.1 The Determinants of School Enroolment

Estimation Method:	**OLS Fixed Effects with cross section standard errors [1]**							
Dependent Variable: Log of Gross Enrollment	**Primary**				**Secondary [2]**			
	Eq. 3.1.11	**Eq.3.1.12**	**Eq.3.1.13**	**Eq.3.1.14**	**Eq. 3.1.21**	**Eq. 3.1.22**	**Eq. 3.1.23**	**Eq. 3.1.24**
(White robust errors t-statistics)								
Log of Total Gross Primary Enrollment	**0.44**	**0.53**	**0.56**	**0.56**	**0.54**	**0.65**	**0.61**	**0.61**
(Previous 5 yr period)	(5.2)	(8.5)	(8.4)	(8.2)	(3.6)	(10.2)	(7.1)	(7.5)
Log of Adult Female Literacy Rate	**0.14**	**0.23**	**0.23**	**0.22**	**0.10**	**0.03**	**0.06**	**0.04**
(Previous 5 yr period)	(4.0)	(5.5)	(5.5)	(4.7)	(1.3)	(0.3)	(0.7)	(0.5)
Expenditures on Education as % of Public Budget	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**
(Previous 5 yr period)	(2.0)	(2.7)	(2.5)	(2.5)	(3.2)	(2.8)	(3.3)	(3.4)
Remittances as % of PPP GDP [3]		**0.02**	**0.005**	**0.03**		**0.04**	**0.04**	**0.04**
(Previous 5 yr period)		(4.5)	(6.4)	(5.6)		(3.7)	(3.9)	(4.4)
Aid as % of PPP GDP			**0.005**	**0.004**			**-0.09**	**-0.09**
(Previous 5 yr period)			(0.6)	(0.5)			-(1.8)	-(1.9)
FDI as a % of PPP GDP				**-0.01**				**-0.01**
(Previous 5 yr period)				-(0.9)				-(0.9)
Interaction (Remittances*Aid)			**-0.001**	**-0.001**			**0.007**	**0.007**
(Previous 5 yr period)			-(1.7)	-(1.8)			(1.5)	(1.6)
Constant	**2.01**	**1.18**	**1.06**	**1.07**	**0.85**	**0.62**	**0.77**	**0.79**
	(5.6)	(4.4)	(3.7)	(3.8)	(1.8)	(1.1)	(1.5)	(1.6)
Number of Countries	50	46	46	46	50	46	46	46
Numbero f Observations	244	155	155	155	243	154	154	154
Method [1]	OLS-FE	OLS-FE	OLS-FE	OLS-FE	OLS-FE	OLS-FE	OLS-FE	OLS-FE
Fixed Effects Likelihood ratio F-test [4]	3.03	1.95	1.93	1.94	23.06	14.27	13.65	13.23
Prob. Value (%)	0%	0.002	0.003	0.003	0%	0%	0%	0%
Adjusted R-Squared	0.95	0.95	0.95	0.95	0.96	0.96	0.96	0.96
Mean of dependent Variable	4.50	4.51	0.34	0.34	3.66	3.71	3.71	3.71
St. Error of Regression	0.08	0.08	0.08	0.08	0.13	0.13	0.12	0.12

[1] In all cases, the Pooled Ordinary Least Squares with country and Period effects was used.

[2] Note that the regressions for the secondary school enrollment include the previous five-year average of the primary school enrollment, not secondary enrollment.

[3] Remittances were deflated by an import deflator and are in % of Real PPP GDP.

[4] Likelihood ratio test for redundant "fixed" country and period effects. I do not reject the test unless the Chi-Square and the F-Test do. In all cases above, the chi-square was well below the rejection value.

Table 3.2 shows the regression results from using Instrumental variables to obtain more accurate and unbiased estimators of the variables of interest. I spoke about the rationale for using instrumental variables in chapter 2. The same rationale applies here. In addition, I use the lagged primary rate of school enrollment to estimate the secondary rate of school enrollment. Overall, the results confirm the results from the previous estimation method. The log of Adult female literacy remains positive and statistically significantly different from zero at the in all cases. It is remarkable that in spite of the bias against women in many developing countries the measure of female literacy proxies well for the female parent's influence in deciding to enroll a child in primary school. I have included an interaction term between remittances and Aid in the OLS regressions to see how this term behaves. My use of this term is in part inspired by the work of Rajan and Subramanian (2005) who compare the effects of remittances and aid on the exchange rate. The interaction term was not significant in the OLS regressions and I have chosen not to include it in the IVs regressions.

Moving to a GMM estimation method brings out an interesting but not surprising result. Of course, the previous five year average of primary school enrollment remains significantly different form zero both in the primary school enrollment regressions as well as in the secondary school enrollment regressions. However, the log of adult female literacy is usually significantly different from zero (except when net FDI is added to the regression, equation 3.3.13) at the primary school enrollment level but its significance disappears at the secondary school enrollment level.

Table 3.2 The Determinants of School Enroolment

Estimation Method:	Instrumental Variables [1]					
Dependent Variable: Log of Total Gross Enrollment	Gross Primary Enrollment			Gross Secondary Enrollment [2]		
	Eq. 3.2.11	Eq. 3.2.12	Eq.3.2.13	Eq. 3.2.22	Eq. 3.2.23	Eq. 3.2.24
(White robust errors t-statistics)						
Log of Total Gross Primary Enrollment	**0.54**	**0.54**	**0.54**	**0.60**	**0.59**	**0.59**
(Previous 5 yr period)	(5.3)	(5.3)	(5.2)	(3.4)	(4.0)	(4.0)
Log of Adult Female Literacy Rate	**0.25**	**0.27**	**0.28**	**0.12**	**0.18**	**0.19**
(Previous 5 yr period)	(2.5)	(2.7)	(2.6)	(0.5)	(0.7)	(0.8)
Expenditures on Education as % of Public Budget	**0.01**	**0.01**	**0.01**	**0.07**	**0.07**	**0.07**
(Previous 5 yr period)	(0.7)	(0.9)	(0.9)	(3.8)	(4.4)	(4.6)
Remittances as % of PPP GDP [3]	**0.03**	**0.05**	**0.05**	**0.07**	**0.10**	**0.10**
(Previous 5 yr period)	(1.9)	(2.3)	(2.2)	(9.9)	(4.6)	(3.8)
Aid as % of PPP GDP		**-0.01**	**-0.01**		**-0.03**	**-0.03**
(Previous 5 yr period)		-(1.1)	-(1.1)		-(2.1)	-(2.1)
FDI as a % of PPP GDP			**0.002**			**0.004**
(Previous 5 yr period)			(0.1)			(0.3)
Constant	**1.07**	**0.95**	**0.95**	**0.29**	**0.01**	**-0.03**
	(2.1)	(1.9)	(1.8)	(0.3)	(0.01)	-(0.03)
Number of Countries	41	41	41	41	41	41
Number of Observations	105	105	105	104	104	104
Method	2SLS-FE	2SLS-FE	2SLS-FE	2SLS-FE	2SLS-FE	2SLS-FE
Adjusted R-Squared	4.53	4.53	4.53	3.77	3.77	3.77
Mean of dependent Variable	0.95	0.95	0.95	0.96	0.96	0.96
St. Error of Regression	0.07	0.07	0.07	0.12	0.12	0.12

[1] In all cases, the Pooled Two Stage Least Squares with country and period effects was used.
Instruments include lagged aid and FDI plus world total for these flows and total world remittances all as a % of PPP GDP.
[2] Note that the regressions for the secondary school enrollment include the previous five-year average of the primary school enrollment, not secondary enrollment.
[2] Remittances were deflated by an import deflator as percent of real $PPP GDP (source WDI and PWT 6.1).

This is not surprising give that microeconomic based studies have pointed out that as the child continues in school, the parents' ability and educational achievement has less influence on the child's own educational achievement.

3.4.2.2. The role of public expenditures on education

While significant in terms of the actual increase or implementation of expenditures in the period in which government expenditures are made, the medium and long-term effects of these expenditures seem to be better predictors of an increase in school enrollment. The results from table 3.1 show that the share of public expenditures on education, while very small in the coefficient, remains statistically significantly different from zero. Remittances themselves are also statistically significantly different from zero and seem to have a larger effect than public expenditures on education. Public expenditures on education may be influencing the availability of

education, for example in rural areas and in poor urban areas; but it is only when households have a more relaxed budget constraint or have an incentive to enroll in school that they then send their children to school. This suggests that relaxing household's income constraints is a significant approach to reducing the hazard of children leaving school.

Using the Instrumental Variables approach to better estimate the regressions brings up a puzzle. Public expenditures on education appear with a negative sign but are not statistically different from zero. There may be two explanations for this. It may be the case, that in fact the share of public expenditures on education does have a small but insignificant effect on primary school enrollment. Or, it may be that as school enrollment decreases during times of economic hardship, remittances serve to alleviate the credit and income constraints of households. It may be the case that as households see themselves forced to get their children out of school, family members form abroad send them more remittances to prevent the children dropping out of school. A very similar situation may also be taking place concerning public expenditures. During hard economic times, government may have to increase the share of public expenditures on education to alleviate some of the hardships poor families may be experiencing, especially if primary schooling is considered a development priority for the country.

In considering the role public expenditures on education have on secondary school enrollment, we again see them as being positive and statistically significantly different from zero. The coefficient also is much larger than that for primary school enrollment, being between 0.11 and 0.15. This obviously tells us that as children continue in school and government spends on public education that education is important.

Table 3.3 The Determinants of School Enroolment

Estimation Method:	**GMM Arellano Bond Estimators** [/1]					
	With cross section standard errors and variance					
Dependent Variable:	**Primary**			**Secondary**		
Log of Total Gross Enrollment	**Eq. 3.3.11**	**Eq. 3.3.12**	**Eq. 3.3.13**	**Eq. 3.3.21**	**Eq. 3.3.22**	**Eq. 3.3.23**
(White robust errors t-statistics)						
Log of RespectiveTotal Gross Enrollment	**0.79**	**0.78**	**0.64**	**0.46**	**0.44**	**0.80**
(Previous 5 yr period)	(14.1)	(14.7)	(6.1)	(2.8)	(5.2)	(5.3)
Log of Adult Female Literacy Rate	**0.07**	**0.09**	**0.09**	**-0.01**	**0.08**	**-0.04**
(Previous 5 yr period)	(2.0)	(2.7)	(2.3)	-(0.04)	(0.5)	-(0.3)
Expenditures on Education as % of Public Budget	**-0.01**	**-0.01**	**0.00**	**0.05**	**0.05**	**0.05**
(Previous 5 yr period)	-(2.2)	-(2.2)	-(1.3)	(4.4)	(6.7)	(3.0)
Remittances as % of PPP GDP [/2]	**0.01**	**0.02**	**0.02**	**0.05**	**0.07**	**0.07**
(Previous 5 yr period)	(2.0)	(4.3)	(2.4)	(2.0)	(5.6)	(5.8)
Aid as % of PPP GDP		**-0.0003**	**-0.001**		**-0.03**	**-0.02**
(Previous 5 yr period)		-(0.1)	-(0.2)		-(3.7)	-(3.1)
FDI as a % of PPP GDP			**-0.01**			**0.004**
(Previous 5 yr period)			-(0.8)			(0.2)
Number of Countries	36	36	36	25	25	25
Number o f Observations	93	93	93	63	63	63
Method	PGMM	PGMM	PGMM	PGMM	PGMM	PGMM
Mean of dependent Variable	0.04	0.04	0.04	0.07	0.07	0.07
St. Error of Regression	0.09	0.09	0.09	0.14	0.14	0.14
Sargan Test	0.58	0.61	0.73	0.82	0.94	0.92

[/1] Instruments include lagged exports, aid and FDI plus world total for these flows and total world remittances all as a % of PPP GDP.

All regressions have period fixed effects.

[/2] Remittances were deflated by an import deflator as percent of real $PPP GDP (source WDI and PWT 6.1).

The results from the GMM estimation confirm the understanding that the share of public expenditures on education does have a positive and statistically significant effect on both primary and secondary school enrollment rates. Again, table 3.3 shows these results. Focusing on primary school enrollment, although very small (0.0012 for the smallest coefficient and 0.07 for the largest), the share of public expenditures on education consistently appears to be positive and statistically significantly different from zero except when net FDI is introduced. It may be that with the additional financing from abroad, the impact of public expenditures is not as great. This result is very similar to that obtained for adult female literacy rate, where also when adding net FDI (in equation 3.313) diminishes the importance of the mother's educational achievement.

Focusing on secondary school enrollment, we notice that public education expenditures have a larger and a consistently statistically significant coefficient, in contrast to the female literacy rate which appears to have lost its significance. Interestingly enough, remittances seem to have a larger impact on both levels of school enrollments than public education expenditures.

4.2.3. The role of remittances in educational achievement

It should also be said that Stark and Wang (2005) have seen remittances as substitutes for government subsidies. In the regressions presented above, that may be a conclusion to be drawn. In general we can say that remittances seem to complement and increase the effect of government expenditures. The effect of remittances seems to be larger than that of public expenditures. In primary schooling, the effect is almost 1.5 times while in secondary schooling it is not as large. This may be because primary schooling is almost universally compulsory and that there is more self-selection as students progress through the school system. Thus, the survival rate decreases.

Remittances may be a greater influence in keeping students in school at the secondary level than at the primary level. While in secondary school, young people may be of enough age to be able to be considered of working age and thus more prone to leave school. Cox and Ureta have found that for El Salvador, remittances do have a stronger effect (in keeping children in school) as the hazard of leaving school increases in these grades (Cox and Ureta, 2003).

As we move through estimation methods, the general story seems to hold, except with the instrumental variables technique. In table 3.1, remittances are consistently positive and statistically significantly different from zero; even the coefficient remains the same for both levels of school enrollment and with the addition of other variables. This same story, however, does not seem corroborated by the Instrumental variables approach, where remittances first appear negative and the positive but always statistically insignificantly different from zero for primary school enrollment. However, for secondary school enrollment, remittances have a somewhat large impact (between 0.17 and 0.26) and are always statistically significantly different from zero by a good margin and thus significant at any significance level.

The long term and dynamic approach of the Generalized Method of moments strongly affirms the importance of remittance for both levels of school enrollment. Remittances appear with a small coefficient of 0.3 or 0.5 at the primary school enrollment level and with a larger coefficient of 0.8 or 0.9 at the secondary school enrollment level. One may say that such small coefficients do not really matter, but when compared to the coefficients of exports or aid or even net FDI, the coefficients of remittances appear to be extremely significant. Indeed table 3.1 does show that aid, although negative, is never statistically significantly different from zero, as is Net FDI, for both levels of school enrollment. The Instrumental variables method also

shows that Aid is negative and insignificantly different from zero for primary school enrollment. For secondary school enrollment, Aid is negative and statistically significantly different from zero at all levels of significance. FDI is shown to be positive but not statistically different from zero.

Finally, the GMM estimation method confirms the results from the previous methods as far as aid is concerned and for both primary and secondary school enrollments. Aid is shown to be negative but not statistically significantly different from zero in the primary school enrollment regressions, and negative and statistically significantly different from zero in the secondary school enrollment regressions. Regarding net FDI, it appears to be negative and statistically significantly different from zero for primary school enrollment. In developing countries, this may be the case if a significant numbers of children work in sweatshops own or outsourced by foreign investment. However, net FDI is not statistically significantly different zero in the secondary school enrollment, although still negative.

Having shown that remittances have a significant and positive impact on school enrollments in the full sample of 62 countries, it is now important to check on the robustness of the findings. I again use a smaller sample of 37 countries using the same reasoning as in chapter two: former socialist republics are dropped as are small island states and countries with less than a million inhabitants. Table 3.4 presents results for primary school enrollment using the three estimation methods used for the full sample. As one can see, remittances generally have a positive and statistically significantly different from zero coefficients, except in the instrumental variables method when Aid and Net FDI are introduced.

Table 3.4 The Determinants of Primary School Enrollment in Selected Countries [1]

Dependent Variable:	**Log of Total Gross Primary Enrollment**					
Estimation Method:	**OLS-FE [2]**		**2SLS-FE [3]**		**PGGM-AB [4]**	
	Eq. 3.4.11	**Eq. 3.4.12**	**Eq. 3.4.21**	**Eq. 3.4.22**	**Eq. 3.4.31**	**Eq. 3.4.32**
(White robust errors t-statistics)						
Log of Total Gross Primary Enrollment	**0.60**	**0.62**	**0.59**	**0.58**	**0.90**	**0.89**
(Previous 5 yr period)	(9.0)	(9.2)	(5.9)	(3.9)	(18.7)	(24.3)
Log of Adult Female Literacy Rate	**0.21**	**0.23**	**0.28**	**0.32**	**0.26**	**0.24**
(Previous 5 yr period)	(4.1)	(4.1)	(4.6)	(1.3)	(4.4)	(6.3)
Expenditures on Education as % of Public Budget	**0.01**	**0.01**	**0.01**	**0.08**	**0.01**	**0.002**
(Previous 5 yr period)	(5.8)	(5.5)	(0.9)	(4.0)	(2.1)	(0.5)
Remittances as % of PPP GDP [5]	**0.03**	**0.04**	**0.04**	**0.13**	**0.05**	**0.06**
(Previous 5 yr period)	(3.5)	(7.8)	(3.5)	(6.9)	(1.6)	(3.9)
Aid as % of PPP GDP		**-0.01**		**-0.04**		**-0.01**
(Previous 5 yr period)		-(2.9)		-(3.3)		-(3.3)
FDI as a % of PPP GDP		**0.002**		**0.01**		**0.003**
(Previous 5 yr period)		(0.2)		(0.7)		(0.3)
Constant	**0.92**	**0.76**	**0.72**	**-0.50**		
	(2.8)	(2.3)	(1.8)	-(0.4)		
Number of Countries	35	35	35	35	23	23
Number of Observations	130	130	118	118	59	59
Method	OLS-FE	OLS-FE	2SLS-FE	2SLS-FE	PGMM	PGMM
Adjusted R-Squared	0.93	0.93	0.93	0.95		
Mean of dependent Variable	4.54	4.54	4.55	3.81	0.04	0.04
St. Error of Regression	0.08	0.07	0.07	0.13	0.09	0.09
Fixed Effects Likelihood ratio F-test [6]	1.68	1.75				
Probability Value	0.02	0.02				
Sargan Test					0.75	0.90

[1] See Appendix A for the list of countries included.

[2] The Pooled Ordinary Least Squares with cross-section and period effect method was used.

[3] The Pooled Two Stage Least Squares with country and period effects was used.
Instruments include lagged exports, aid and FDI plus world total for these flows and total world remittances all as a % of PPP GDP.

[4] Instruments include lagged exports, aid and FDI plus world total for these flows and total world remittances all as a % of PPP GDP.
All regressions have period fixed effects and cross section standard errors and variance.

[5] Exports and remittances were deflated by an import deflator as percent of real $PPP GDP (source WDI and PWT 6.1).

[6] Likelihood ratio test for redundant "fixed" country and period effects.
I do not reject the test unless the Chi-Square and the F-Test do. In all cases above, the chi-square was well below the rejection value.

Aid is generally negative but the statistical significance depends on the estimation method, with instrumental variables showing aid to be negative but not statistically significantly different from zero. FDI is shown to have a positive impact on school enrollments but it is statistically significantly different from zero only in the Generalized Method of Moments method. The log of Adult female literacy appears to be statistically significantly different from zero also, except when the instrumental variables method is used and Aid as well as FDI are introduced (equation 3.4.22).

The regressions showing the effects of the variables of interest on secondary school enrollment are shown in table 3.5. Again, remittances are shown to be extremely important for these countries as remittances affect both the primary and secondary school enrollment rates. The highest coefficient of remittances is given by the Instrumental variables method at 0.22 (equation 3.5.22). The statistical significance is also comfortable shown to be significantly different from zero at all levels. Aid, unfortunately, is shown to be negative and statistically significantly different from zero in the Instrumental Variables method and in the GMM technique. Given that most of the countries in the sample are much larger countries and also more integrated countries, this should not come as a surprise as these countries do not receive significantly high official development assistance (with the exception of Egypt in the sample) as some of the former soviet and Small Island states would.

Net FDI is shown to be positive in two of the estimation methods used but it is not shown to be statistically significantly different from zero. Only when the GMM technique is used is net FDI shown to be negative, although not statistically significantly different from zero. Interestingly enough, exports consistently are shown to be negative) although with an extremely low coefficient and certainly never statistically significantly different from zero.

3.5. Are There Gender Differences?

It seems that if we use the full sample of countries to determine if there are any gender differences, we get the general result that remittances have a positive and significant impact on both male and female school enrollment at the primary and secondary levels. More interesting is the fact that the log of adult female literacy used as a proxy for the female parent's educational achievement has a more positive effect on female school enrollment than in male school enrollment. This makes sense when we consider that some countries have a cultural bias against girls and so the higher the mother's literacy rate the higher the probability that the female child will stay in school. Female literacy remains positive when considering male school enrollment but is statistical significance diminishes in some estimation methods. In contrast, when considering female school enrollment, the previous 5-year average of the log of adult female literacy remains statistically significantly different from zero. Table A.3.1 presents the estimation results for primary school enrollment while table 3.2 presents the estimation results for secondary school enrollment. Interesting to note also is the fact that no other financial flow remains statistically significantly different from zero besides remittances as we move through estimation methods. This speaks highly of the robustness and significance of the impact on school enrollments of remittances in developing countries.

Having presented some gender regression results and having stated that female adult literacy seems to proxy well for the mother's school achievement, it is also important to present some regional results. The "missing women" paradox is more pronounced, for example, in Asia than in other regions of the world. It would be interesting if primary or secondary school enrollments show some difference in the regions. Unfortunately, given the limited data availability to carry out full-fledged

gender regional breakdowns, I simply present in tables A.3.3. and A.3.4 the regional results for primary and secondary school enrollments. Another word of caution is warranted here also; the data points for the Asia Pacific region does not allow us to draw definite conclusions. Moreover, we would do a disservice to the region if we summarize the results here. I present some results simply for comparison purposes only and to have a guidepost to summarize the results obtained for Latin America. Interestingly enough, exports seem to decrease primary and secondary school enrollment in Latin America, while remittances seem to increase them. The effect is always statistically and significantly different for primary school enrollment while it is not always significantly differently from zero for secondary school enrollment. This finding accords well with studies that say that by secondary schooling the child's ability and enthusiasm do more to keep him or her in school than any other variables. Aid appears to be statistically significantly different from zero at the primary level but not at the secondary school enrollment level. This may be the case since Aid is usually aimed more at the basic levels and the rural areas, and given the limited availability of secondary schooling in rural areas, primary schooling would be more affected. Another reason again may be the students' abilities by the time they reach level of schooling.

Some results from the different regions seem to be contradictory with each other, like for example the role of aid in Latin America as compared to Asia Pacific, or the role of FDI, but it would be hard to draw clear conclusions from this given the limitations with the Asia Pacific regressions. On a more positive note, the role of adult female literacy seems to be always strong and statistically significantly different from zero in the two regions.

Table 3.5 The Determinants of Secondary School Enrollment in Selected Countries [1]

Dependent Variable:	Log of Total Gross Secondary Enrollment					
Estimation Method:	OLS-FE [2]		2SLS-FE [3]		PGGM-AB [4]	
	Eq. 3.5.11	Eq. 3.5.12	Eq. 3.5.21	Eq. 3.5.22	Eq. 3.5.31	Eq. 3.5.32
(White robust errors t-statistics)						
Log of Total Gross Primary Enrollment (Secondary in GMM) [5]	**0.60**	**0.62**	**0.59**	**0.58**	**0.62**	**0.68**
(Previous 5 yr period)	(5.5)	(5.8)	(3.2)	(3.9)	(8.2)	(9.5)
Log of Adult Female Literacy Rate	**0.001**	**0.02**	**0.19**	**0.32**	**0.34**	**0.27**
(Previous 5 yr period)	(0.01)	(0.2)	(0.7)	(1.3)	(2.6)	(1.7)
Expenditures on Education as % of Public Budget	**0.01**	**0.01**	**0.07**	**0.08**	**0.07**	**0.06**
(Previous 5 yr period)	(2.1)	(2.2)	(3.3)	(4.0)	(5.6)	(4.1)
Remittances as % of PPP GDP [6]	**0.04**	**0.05**	**0.09**	**0.13**	**0.11**	**0.10**
(Previous 5 yr period)	(2.7)	(2.9)	(4.8)	(6.9)	(3.9)	(2.9)
Aid as % of PPP GDP		**-0.01**		**-0.04**		**-0.02**
(Previous 5 yr period)		-(1.4)		-(3.3)		-(1.8)
FDI as a % of PPP GDP		**0.002**		**0.01**		**-0.07**
(Previous 5 yr period)		(0.1)		(0.7)		-(1.6)
Constant	**0.96**	**0.83**	**0.01**	**-0.50**		
	(1.5)	(1.2)	(0.01)	-(0.4)		
Number of Countries	35	35	35	35	30	30
Number of Observations	129	129	117	117	83	83
Method	OLS-FE	OLS-FE	2SLS-FE	2SLS-FE	PGMM	PGMM
Adjusted R-Squared	0.96	0.95	0.95	0.95		
Mean of dependent Variable	3.76	3.76	3.81	3.81	0.10	0.10
St. Error of Regression	0.12	0.12	0.12	0.13	0.15	0.16
Fixed Effects Likelihood ratio F-test [7]	16.97	14.86				
Probability Value	0%	0%				
Sargan Test					0.91	0.88

[1] See Appendix A for the list of countries included.

[2] The Pooled Ordinary Least Squares with cross-section and period effect method was used.

[3] The Pooled Two Stage Least Squares with country and period effects was used.
Instruments include lagged exports, aid and FDI plus world total for these flows and total world remittances all as a % of PPP GDP.

[4] Instruments include lagged exports, aid and FDI plus world total for these flows and total world remittances all as a % of PPP GDP.
All regressions have period fixed effects and cross section standard errors and variance.

[5] Note that the regressions for the secondary school enrollment include the lags of primary school enrollment, except in the GMM method, which includes the previous five-year average of the secondary school enrollment.

[6] Remittances were deflated by an import deflator as percent of real $PPP GDP (source WDI and PWT 6.1).

[7] Likelihood ratio test for redundant "fixed" country and period effects.
I do not reject the test unless the Chi-Square and the F-Test do. In all cases above, the chi-square was well below the rejection value.

3.6. Conclusion

I have presented estimates of the impact of remittances on school enrollments in developing countries. Considering a baseline specification in which adult female literacy rates, used as a proxy for female parental schooling, it appears that remittances have a positive impact on primary and secondary school enrollments. Understandably so, the effect of female parental schooling becomes insignificant as the child progresses through higher grades. The impact of public expenditures on education seems to be positive and significant also, but remittances generally have a greater impact, being at least 1.2 times greater than public expenditures on education. The role of those variables seems to be important in determining primary and secondary school enrollment but less clear when considering tertiary school enrollment. It is understandable that in general that parental schooling would not have a significant effect on tertiary education. But, the impact of the other variables does not appear to be significantly different from zero either when using the estimation techniques that had been used to estimate the impact of those same variables on primary and secondary schooling.

When using a different estimation technique, all of the variables become significantly different from zero, but the estimation technique that had been used to estimate primary and secondary schooling cannot be rejected as useless. This puzzle appears to give rise to the ambivalent view in research circles regarding the effect of migration and remittances on skilled workers. There seem to be grounds for believing that migration drains poor countries of especially skilled workers and that the benefits of this drain in the form of remittances are not enough to counter the costs for developing countries. At the same time, more recent theory and the lack of clear results regarding the

loss of benefits for developing countries seems to say that it is too early to say that there clearly is a brain drain from developing countries. As globalization continues and more and more people migrate, it is reasonable to say that continued research on the subject and the data that become available will throw clearer light on the subject.

There is also the interesting finding that generally the impact of remittances seems to be greater that that of public education expenditures. This may need to be further researched and considered. This will be especially important for developing countries as they make decisions on which levels of education to focus their scarce resources.

FOR FURTHER RESEARCH: REMITTANCES, POVERTY AND INEQUALITY

4.1. Introduction

As I stated in the introduction, studying how remittances affect the poorest of the poor in those developing countries most affected by remittances, is interesting. One reason why this is important is that many migrants come from the poorer rungs of society and are usually from the countryside. Thus, as they migrate and send money back, they affect the poverty levels of the lower quintiles and of the rural sector in a country—as well as the total national numbers.

This chapter offers some possibilities for future research and tries to lay a framework for it. It explains how the impact of remittances on poverty has and can be studied as well as discusses some methodological and data availability challenges that need to be dealt with to properly study the impact of remittances on poverty and eventually on inequality. The chapter is more a summary of "where things are" than a presentation of research guided by a model and some empirical findings. The chapter is divided as follows. In part two, I present the scant literature relating remittances to poverty and develop the theory behind the tests to see how robust the link between several measures of remittances and poverty is. The reason why I focus on analyzing

the relationship between several measures of remittances and of poverty is that, up to last year, there was typically only one measure of remittances. But, the literature had called for a reassessment of how remittances were accounted for (Bilsborrow, et al, (1997)), and there were always authors who made their own estimates from IMF and World Bank figures. To get a better handle, the World Bank has now expanded the items included in the old measure of remittances. That, however, does not seem to lead to a satisfactory solution. In addition, I compare the impact remittances and aid may have on poverty. This comparison is important and interesting for several reasons, two of them are that the EU has threatened to cut aid to source countries that send a lot of migrants to the EU member countries and that different kinds of donor funding can affect a country's exchange rate as well as the poverty levels in the recipient country. Given that the chapter is more empirical than theoretical, I do not focus on the model I have been developing and instead focus on the econometric analysis.

In part three, I describe the data I have used and give summary statistics for the variables in the study. In part four, I present some econometric results and discuss some of the limitations of these results, mainly due to the availability of data to properly carry out sophisticated econometric analysis that can shed light on the link between remittances, aid, and poverty. I use two estimation techniques to be able to corroborate the results: Ordinary Least Squares with White robust errors and Heteroskedasticity consistent errors and covariance, and Instrumental variables. The analysis shows that while helping reduce poverty, the measures of remittances analyzed are not robust to specifications as other flows are introduced. Furthermore, in some regression results using the Instrumental Variables method, neither remittances not aid seem to be statistically significantly different from zero. The

results show that not all measures of remittances and regression specifications support the statement that remittances help reduce poverty. The results also show that the greatest impact of remittances in reducing poverty occurs at the $1 poverty level, when considering the headcount but at the $2 a day level when the poverty gap squared is considered. Finally, in the conclusion of the chapter I summarize the results and offer some more possibilities for future research as well as some policy implications.

4.2. Remittances and Poverty

The only paper I am aware of that formally relates remittances to the impact they can have on poverty at the cross-national level is that by Adams and Page "International Migration, Remittances and Poverty in Developing Countries," (2003). They wrote that article exploring the relationship between poverty and remittances. They used a relatively new database using poverty rates from the World Bank and included some middle income countries. They also acknowledged the problems with the "remittances" measure used at the time given the difficulty governments had in reporting correct numbers. The remittances data has several shortcomings studied elsewhere in the literature. Adams and Page's conclusion was that remittances helped reduce poverty in developing countries. They used point-based OLS regressions and used the share of remittances on GDP as the main variable. They argued that using differenced-based OLS regressions would be a bit more complicated to explain and derive meaningful results from. I tried those differenced regressions and got no meaningful results. Another paper that presents some remittances and poverty regressions, but does not explain the methodology and the data used, is that by Robert Holzmann in "Labor Market & Social Protection: Aspects of International Migration" (2004). Rajan and Subramaniam recently studied the impact of aid on the exchange

rate of the recipient country and they found that aid appreciates the exchange rate while remittances do not.

I differentiate my study in two significant ways. I am focusing on a smaller sample of only developing countries, but consider more data points given the availability of new data. Considering fewer countries does not rob the results of meaning. In fact, it makes them more relevant for those countries for which remittances are an important source of foreign exchange and have been for a significant period of time. Of the 62 countries studied in the previous chapters, I have settled on 42 of these developing countries for two reasons. Given that the data on poverty and inequality is much scarcer, of the countries that have available data on remittances, I obtain data on poverty and inequality for 42 countries that can be used.

I also consider mainly two measures of remittances to see if the new measure has a better impact in our studies regarding poverty and migration. Up to last year, one could download two different measures of remittances from the WDI; one included what had been recognized as part of the "unrequited transfers" migrants in the host country sent to their families in the home country, the newer measure tries to capture not only these unrequited transfers but also includes other transfers and income payments. The results indicate that the new measure does not perform better than the old one. I argue that theoretically the new measure does not make significant inroads into our understanding of migrant remittances themselves. In addition, I compare the effects of Remittances to that of aid. The reason I do this is that given contemporary issues regarding migration and aid, comparing the effects of these two will help policy makers see what the most effective tools to eradicate poverty in developing countries are. In addition, since I have already used the exchange rate in the previous studies,

testing Rajan and Subramanian' findings in a concrete outcome of aid and remittances (like poverty) would be useful.

4.3. Data and Statistics

For the estimation of the relationship between remittances and the different measures of poverty, I do add other variables. This controls for spurious results and adds more insights into the relationship between remittances and other variables. I use data from the *World Development Indicators* and from the *Global Development Finance* (all online) as the primary data sources for the econometric analysis. I use the WDI data especially those pertaining to per capita income and remittances. Data from the *Global Development Finance* is used to complement the data from the WDI and to have a better break down of the data on financial flows. I distinguish among the sources for the variables used whenever that is necessary. In addition, data from the *Penn World Tables*, version 6.1, is used to complement or to deflate the primary data. For example, to be able to get better estimates of the Purchasing Power Parity Gross Domestic Product of some countries, I use the WPT. Also, I use data from the *International Financial Statistics,* online version, to complement the primary data. The data on poverty come from PovCal net, the World Bank's new website on poverty and inequality. I also use the data on Net Aid Rajan and Subramaniam used to see if their measure performs any differently from the one given by the World Bank.

Table 5 shows summary statistics for the poverty measures. The statistics do allow us to say that there still is a lot of poverty in some countries while others have made strides in reducing it.

Table 5. Poverty Measures for Selected Countries

At One dollar a day

	Survey Mean Income	Headcount	Poverty Gap	Squared Gap
Mean	147.9	18.2	6.2	3.1
Median	127.8	14.0	3.4	1.3
Maximum	425.7	72.3	37.4	23.7
Minimum	31.5	0.04	0.02	0.01
Observations	200.0	197.0	197.0	197.0

At Two dollars a day

	Gini Coefficient	Headcount	Poverty Gap	Squared Gap
Mean	42.6	42.1	18.6	10.6
Median	42.0	37.4	14.9	7.7
Maximum	60.7	90.9	60.5	44.7
Minimum	22.8	0.12	0.03	0.01
Observations	200.0	199.0	199.0	198.0

Source: PovCal Net.

Note: The survey mean income and the Gini coefficient are the same at both poverty levels.

Table 6 shows summary statistics for two kinds of remittances data. The first two columns present the shares of remittances on PPP GDP according to the earlier way of reporting used by the World Bank. This is the one I have used in the previous chapters. It did not include the line "compensation of employees." This line includes the compensation paid by international organizations, like the UN and NGO's, to national staff. The World Development Indicators now report the line "Remittances and compensation of employees" together as one. Part of what this does is that it tries to account for the "unreported" remittances. I have deflated the earlier measure in two different ways: by using a computed Import Deflator and by using the United States Wholesale price index. Either way of deflating them gives very similar results. Column three of the table shows the new measure of remittances and compensation of employees deflated by the import deflator. All items reported are in shares of PPP GDP, except the remittances measures which are as shares of Real PPP GDP. Notice that I have reported other flows to compare the remittances measures to them. In the regressions, I only report the aid measure.

Table 6. Summary Statistics for Selected Flows

	Remittances as a Share of PPP GDP			
	Deflated by Import Deflator	Deflated by USWPI	Deflated by Import Deflator [1/]	Aid
Mean	1.30	1.24	1.40	0.70
Median	0.60	0.57	0.68	0.20
Maximum	13.13	12.63	13.13	5.78
Minimum	0.00	0.003	0.01	0.00
Observatic	163.0	178	176	198

[1/] Remittances and Compensation of Employees

Source: PovCal Net.

All measures are in shares of PPP GDP, unless otherwise noted.

Worthy of noticing is the fact that the maximum share of remittances on constant PPP GDP is 13.13 for the two measures of remittances that are deflated by an import deflator. The average share for the countries in the study is much less than the maximum, standing at 1.3 or 1.4 percent. None of the other inflows has a maximum above ten percent while the average is always less than one percent. This shows how important remittances are for the group of countries studied.

4.4. Econometric Results

The results from the regressions are telling and interesting. The measures of remittances all seem to behave in the same way. This is not surprising given that the shares of remittances on GDP were all very similar. Table 4.3 shows the regression results for the poverty headcount using both the earlier measure of remittances and the new measure of remittances and compensation of employees. The findings from these regressions show that the greatest impact of remittances on poverty occurs at the one dollar a day measure. As in Adams and Page, the findings show that, holding inequality constant and controlling for income, remittances help reduce poverty. The coefficient for remittances at $1 a day shows that for every ten percent increase in the share of remittances, there is a decrease in people living in poverty of 1.4 percent (Their results show a 1.9 decline in the poverty headcount). However, once aid is

included in the regressions, the coefficient for remittances decreases and becomes statistically insignificantly different from zero at the 5% level. The same story holds for the $2 a day measure. The elasticity of poverty on remittances is now only 0.07 and decreases when aid is added to the regression.

Regarding the new measure of remittances, including compensation of employees, we can make the following analysis. Table three also shows that the greatest impact of remittances and compensation of employees on poverty is still at the $1 a day measure. Once we add aid as another explanatory variable, remittances remains statistically significantly different from zero but its impact decreases. It appears that aid has more impact in reducing poverty than remittances do. This may be explained by the fact that some aid is usually aimed to help the poorest of the poor, those who would have less than a dollar a day to live, while remittances usually go to families who have had access to some funds to send their relative abroad and usually have more resources altogether. At the $2 a day measure, remittances and compensation of employees has a lesser impact on poverty, with an elasticity of 0.07 percent. When introducing aid, however, the impact of remittances decreases and becomes statistically insignificantly different from zero at the one percent level.

Table 4.3. Poverty Headcount and Remittances

Dependent Variable	Remittances				Remittances and Compensation of Employees			
	At one Dollar		At Two Dollars		At one Dollar		At Two Dollars	
(White robust errors t-statistics)								
Remittances as % of Real PPP GDP	**-0.14**	**-0.08**	**-0.08**	**-0.05**	**-0.15**	**-0.10**	**-0.07**	**-0.04**
	-(3.7)	-(1.8)	-(3.3)	-(2.3)	-(4.4)	-(2.7)	-(3.0)	-(2.0)
Aid		**-1.76**		**3.32**		**-1.74**		**3.39**
		-(2.4)		(4.6)		-(2.4)		(4.8)
Mean Survey Income	**-2.35**	**-2.45**	**-1.59**	**-1.63**	**-2.30**	**-2.38**	**-1.57**	**-1.61**
	-(20.3)	-(19.5)	-(12.5)	-(12.4)	-(21.7)	-(20.9)	-(13.1)	-(13.2)
Constant	**-2.10**	**-1.76**	**-2.10**	**3.32**	**-2.04**	**-1.74**	**3.23**	**3.39**
	-(2.6)	-(2.4)	(4.4)	(4.6)	-(2.6)	-(2.4)	(4.5)	(4.8)
Adjusted R-Squared	0.82	0.83	0.78	0.79	0.83	0.00	0.79	0.00
Observations	161	161	163	163	174	0	176	0
Estimation Method	OLS /1	OLS /1	OLS /1	OLS /1	OLS /1	OLS /1	OLS /1	OLS /1

Notes: All variables in logs

The remittances measure only includes remittances

/1 White Heteroskedasticity-consistent Errors and Covariance

Using the Instrumental variables estimation method generally reduced the coefficient of both remittances and aid and made both of them statistically not significantly different from zero. This result is not as credible as far as there may be limitations with the data and the availability of refining the estimation method itself. For example, since I am only using a point-based estimation using whatever data points are available in specific years, I cannot differentiate the data by country and period. This is a major concern of any statistical study and certainly bears on the kinds of conclusions that one can derive from the results obtained.

Table 4.4 shows the effect of remittances on the Poverty Gap squared. I am not reporting regression results on the simple poverty gap measure as it is not as useful as the poverty gap squared. Remittances alone have a greater impact at the $2 a day measure but become statistically insignificantly different from zero when the measure of aid is introduced. Both at the $1 and $2 a day measures the remittances measure becomes smaller and statistically not significantly different from zero. As in the headcount regressions, the fit generally improves but at the expense of the loss of significance regarding remittances. I tried to introduce other measures of capital flows in the regressions. The results change the coefficients of the variables a bit, but only the aid measure seems to be robust in terms of the statiscal significance.

Regarding the squared poverty gap measure and the new measure of remittances and compensation of employees, table four also presents some regression results. The results show a very similar pattern to that of the poverty headcount. At $1 a day, remittances have a large impact and are significantly different form zero. However, when introducing the aid measure, the impact of remittances decreases and becomes insignificantly different from zero, while the aid measure has a larger impact and is statistically significantly different from zero. At $2 a day, the impact of

remittances in reducing the poverty gap squared is small at 0.12 or 0.09 depending on which measure of remittances we use, but is statistically significantly different from zero. When introducing the aid measure in the regression, the impact of remittances, again, becomes smaller and also becomes statistically not significantly different from zero. The aid measure enters with a larger coefficient and with the expected sign.

Following Adams and Page, worthy of mention is the fact that the survey mean income is always statistically significantly different from zero in all the regressions and that holding inequality constant helps achieve a better fit in the regressions and the survey mean income is always statistically significantly different from zero. The reasons for this is that the survey income gives a better measure of what kind of income the poor are able to have in spite of the level of average income in a country.

4.5. Conclusion

I have presented major reasons why studying the impact of remittances in developing countries is important and why it is so especially in countries that have a high share of remittances on GDP. The literature on Remittances is full of stories on mainly the negative consumption impact that workers' remittances have on the economy of the recipient country. However, that literature is based more on stories and non-rigorous studies regarding what people in individual villages or countries do with the money they receive. The existing literature that uses rigorous econometric studies to analyze the impact of remittances has not gone far enough in fully studying the impact of remittances.

The results regarding remittances and poverty have been interesting. The impact of remittances seems to be in general positive and important. However, the results show the lack of robustness regarding the measures of remittances used.

Table 4.4 Poverty Gap Squared and Remittances

Dependent Variable:	**Remittances**				**Remittances and Compensation of Employees**			
Poverty Gap Squared	At one Dollar		At Two Dollars		At one Dollar		At Two Dollars	
(White robust errors t-statistics)								
Remittances as a % of Real PPP GDP	**-0.07**	**-0.02**	**-0.10**	**-0.07**	**-0.12**	**-0.09**	**-0.09**	**-0.05**
	-(1.3)	-(0.3)	-(3.7)	-(2.2)	-(2.3)	-(1.5)	-(2.3)	-(1.2)
Aid		**-0.12**		**-0.08**		**-0.08**		**-0.09**
		-(2.5)		-(3.3)		-(1.9)		-(3.5)
Mean Survey Income	**-2.39**	**-2.47**	**-2.13**	**-2.19**	**-2.31**	**-2.37**	**-2.14**	**-2.21**
	-(14.0)	-(13.8)	-(18.2)	-(18.2)	-(15.1)	-(14.4)	-(17.5)	-(17.2)
Constant	**-7.40**	**-7.09**	**-0.92**	**-0.71**	**-7.23**	**-7.03**	**-0.86**	**-0.64**
	-(5.1)	-(5.1)	-(1.4)	-(1.2)	-(5.2)	-(5.2)	-(1.3)	-(1.1)
Adjusted R-Squared	0.66	0.67	0.83	0.84	0.66	0.66	0.82	0.83
Observations	161	161	162	162	174	174	175	175
Estimation Method	OLS /1	OLS /1	OLS /1	OLS /1	OLS /1	OLS /1	OLS /1	OLS /1

Notes: All variables in logs

The remittances measure includes remittances only

/1 White Heteroskedasticity-consistent Errors and Covariance

The analysis suggests some other areas of research regarding remittances. However, obtaining better data to cover more countries for the poverty measures would be of extreme importance is we want to obtain reliable results.

CONCLUSION

It has been an exciting time trying to study the impact of remittances in developing countries. When I started my study, very few studies focused on the positive impact remittances can have in developing countries. All of that changed as I continued my research and tried to focus on something that had not been done before. I believe persistency and hope helped me to see what needed to be done. Thus, while the IMF did come up with a study that they focused on how remittances would affect savings, they did not present their formal and rigorous methodology. I went further in explaining and finding out whether there would be an impact on investment.

The Overlapping Generations model showed that remittances do not have to be seen as always having a negative effect in the receiving country. Those remittances can be used for saving and investment as well as to finance children's education or to pay for one's previous education.

The econometric results generally showed that remittances do have a positive and statistically significantly different from zero effect on primary and secondary school enrollment. The sophistication of the estimation methods used makes me confident in the results and in the techniques. There were no major discrepancies and the results seemed

to show the consistency of the estimation methods. When studying the impact of remittances on savings and investment one has to be more cautious. Individual country policies regarding migrants and their savings or investment in the home country may matter. Regional differences seem to also affect the way in which remittances have an impact in the local economy. While the results were mostly positive, the inconsistencies shown in the GMM method do not allows to draw clear conclusions about this generally positive effect of remittances on savings and investment.

Finally, I believe the last chapter serves to illustrate the dire need to have better data collection especially concerning poverty and inequality. The limitations of the time series data on poverty prevents robust estimation and confidence in the results obtained. I hoop that can be remedied in the future, as I look forward to continue deepening my knowledge of the subject matter.

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APPENDIX
COUNTRIES, DATA, AND METHODOLOGY

Countries Included in this Study:

Country Code	*Country Name*
ALB	Albania
DZA	Algeria
ARG	Argentina
AZE	Azerbaijan
BGD	Bangladesh
BRB	Barbados
BLZ	Belize
BEN	Benin
BOL	Bolivia
BIH	Bosnia and Herzegovina
BRA	Brazil
BFA	Burkina Faso
KHM	Cambodia
CPV	Cape Verde
CHN	China
COL	Colombia
COM	Comoros
CRI	Costa Rica
HRV	Croatia
DMA	Dominica
DOM	Dominican Republic
ECU	Ecuador
EGY	Egypt, Arab Rep.
SLV	El Salvador
GEO	Georgia
GTM	Guatemala
GUY	Guyana
HTI	Haiti
HND	Honduras
IND	India
JAM	Jamaica
JOR	Jordan
KGZ	Kyrgyz Republic
LBN	Lebanon
MKD	Macedonia, FYR
MDG	Madagascar
MLI	Mali
MEX	Mexico

Countries in the Study (continued)	
Country Code	*Country Name*
MNG	Mongolia
MAR	Morocco
MMR	Myanmar
NPL	Nepal
NIC	Nicaragua
NER	Niger
NGA	Nigeria
PAK	Pakistan
PRY	Paraguay
PER	Peru
PHL	Philippines
WSM	Samoa
SEN	Senegal
LKA	Sri Lanka
KNA	St. Kitts and Nevis
LCA	St. Lucia
SDN	Sudan
TGO	Togo
TON	Tonga
TTO	Trinidad and Tobago
TUN	Tunisia
TUR	Turkey
VUT	Vanuatu
YEM	Yemen, Rep.

There were several countries that were excluded from this study. The reasons for excluding them varied, but referred mainly to data unavailability or because their measures would mean nothing for policy (Like Venezuela and Cuba). Overall, there is a total of 62 countries.

The 37 countries in the robustness check sample are:
Argentina, Bangladesh, Bolivia, Brazil, Barbados, China, Colombia, Costa Rica, Dominican Republic, Algeria, Ecuador, Egypt, Arab Rep., Guatemala, Guyana, Honduras, Haiti, India, Jamaica, Jordan, Cambodia, Sri Lanka, Morocco, Madagascar, Mexico, Mali, Nigeria, Nicaragua, Nepal, Pakistan, Peru, Philippines, Paraguay, Senegal, El Salvador, Togo, Trinidad and Tobago, Tunisia, and Turkey.

Country classifications by region:

LAC: Latin America and the Caribbean

ARG

BLZ
BOL
BRA
BRB
COL
COM
CRI
DMA
DOM
ECU
GTM
GUY
HND
HTI
JAM
KNA
LCA
MEX
NIC
PER
PRY
SLV
TTO

EECA: Eastern Europe and Central Asia:

ALB
AZE
BIH
GEO
HRV
KGZ
MKD
TUR

MENA: The Middle East and North Africa

DZA
EGY
JOR
LBN
MAR
TUN
YEM

SSA: Subsaharan Africa

BEN
BFA
CPV
MDG
MLI
NER
NGA
SDN
SEN
TGO

AP: East and South Asia and the Pacific

BGD
CHN
IND
KHM
LKA
MMR
MNG
NPL
PAK
PHL
TON
VUT
WSM

Following are some selected descriptive statistics of the variables of interest.

Table A.1.1 Descriptive Statistics of Selected Variables

3 year average period [1/]	1	2	3	4	5	6	7	8	9	10	11	12
Remittances [2]												
Mean	0.60	0.57	1.70	1.69	1.59	1.66	3.20	2.17	1.91	1.79	2.01	2.38
Median	0.48	0.32	0.60	0.63	0.71	0.86	0.91	0.85	0.83	1.12	1.08	1.28
St. Dev.	0.64	0.64	2.86	2.97	2.63	2.05	7.77	4.23	3.11	2.33	2.31	2.78
Minimum	0.03	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.05
Maximum	1.30	1.72	12.09	11.76	12.03	9.27	43.19	23.74	15.05	11.65	9.67	12.68
Gross National Savings												
Mean	4.31	9.77	10.55	10.77	7.34	6.57	7.62	6.22	6.65	6.89	6.24	6.63
Median	4.70	8.23	8.57	8.66	6.50	5.90	6.45	5.66	6.04	6.46	5.99	6.11
St. Dev.	2.59	9.02	8.00	9.65	5.65	3.89	4.46	4.20	4.12	3.93	3.84	4.15
Minimum	1.54	1.85	1.48	-1.54	-1.55	0.50	1.96	-5.42	-2.73	-0.06	-2.49	-6.31
Maximum	6.68	38.23	32.93	35.60	22.28	16.44	19.37	14.35	16.71	18.27	17.20	18.61
Investment												
Mean	5.46	9.83	12.86	13.90	10.40	8.59	9.34	8.37	8.88	9.20	8.02	8.35
Median	5.99	8.96	10.92	12.13	8.09	7.38	7.84	7.72	7.57	8.37	7.44	7.52
St. Dev.	3.77	4.72	8.58	8.11	6.46	4.36	5.87	3.86	4.07	4.26	3.87	4.11
Minimum	1.45	2.32	2.55	2.79	2.58	2.86	2.72	1.43	3.01	2.65	3.14	3.37
Maximum	8.94	22.28	38.62	34.89	31.26	21.47	33.92	17.38	23.56	23.13	24.15	22.55

Sources: World Development Indicators 2005, Global Development Finance 2005, International Financial Statistics Online, Penn World Tables 6.1

[1/] The twelve three-year period averages start in 1970 and end in 2003 in this study.

[2] Remittances were deflated by an import deflator as percent of real $PPP GDP.

Table A.1.1 Descriptive Statistics of Selected Variables (continued)

3 year average period [1/]	1	2	3	4	5	6	7	8	9	10	11	12
Exports												
Mean	4.90	7.10	10.09	11.15	10.67	10.55	10.91	9.95	11.64	11.69	12.15	11.95
Median	4.00	5.53	7.13	7.26	6.99	6.69	7.31	7.42	8.74	9.52	9.05	10.36
St. Dev.	1.73	5.35	8.31	11.47	9.70	9.98	9.89	8.92	9.28	8.35	8.71	7.84
Minimum	3.80	0.80	0.85	0.94	1.07	1.08	1.16	1.30	1.28	1.55	2.27	2.70
Maximum	6.89	20.02	30.73	46.75	37.87	43.40	38.88	40.64	41.37	34.39	41.34	37.26
Aid												
Mean	0.13	1.15	1.38	2.08	1.15	1.48	1.53	1.42	0.95	0.82	0.66	0.66
Median	0.10	0.22	0.38	0.52	0.67	0.78	0.76	0.65	0.43	0.39	0.36	0.28
St. Dev.	0.08	1.71	2.57	4.39	1.70	1.77	1.75	1.58	1.16	1.00	0.71	0.96
Minimum	0.06	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.00	0.00
Maximum	0.23	5.86	12.41	21.98	8.81	7.80	7.63	6.10	4.56	3.80	2.19	4.99
Net Foreign Direct Investment												
Mean	0.65	0.51	0.48	0.51	0.49	0.55	0.88	0.70	0.86	1.44	1.28	1.33
Median	0.14	0.13	0.20	0.23	0.14	0.15	0.26	0.31	0.62	1.11	1.05	0.71
St. Dev.	0.93	1.20	0.74	0.71	1.14	1.29	2.49	1.36	0.98	1.58	1.23	2.01
Minimum	0.09	-0.38	-0.04	-0.05	-0.36	-0.15	-2.10	-0.10	-0.81	-1.78	0.03	-0.52
Maximum	1.72	4.35	3.33	3.16	6.19	6.64	13.98	8.06	4.68	8.19	6.46	11.03
Current Account [3]												
Mean	-2.76	-1.85	-4.51	-5.56	-6.84	-3.43	-2.85	-4.97	-5.20	-5.70	-4.75	-3.76
Median	-4.03	-3.24	-4.20	-5.50	-6.40	-2.72	-2.25	-4.37	-3.64	-4.29	-3.99	-2.33
St. Dev.	3.71	5.79	4.62	4.28	5.78	4.23	6.79	7.23	6.91	6.27	6.61	8.65
Minimum	-5.66	-7.36	-13.85	-13.71	-27.91	-14.05	-26.01	-31.68	-34.76	-23.82	-25.74	-29.23
Maximum	1.42	13.93	5.93	3.79	0.98	4.32	15.30	7.43	4.57	3.19	8.86	12.85

Sources: World Development Indicators 2005, Global Development Finance 2005, International Financial Statistics Online, Penn World Tables 6.1

[1] The twelve three-year period averages start in 1970 and end in 2003 in this study.

[2] Exports were deflated by an import deflator as percent of real $PPP GDP.

[3] The current account is in percentage of GDP.

Table A.2

Pairwise Correlation

	Saving	Remittances	Aid	Investment	Net FDI	Exports	Loans	Portfolio Flows
Saving	1	0.154	0.044	0.763	0.262	0.486	0.072	0.038
Remittances	0.154	1	0.330	0.249	0.057	0.242	0.077	-0.071
Aid	0.044	0.330	1	0.111	0.018	0.052	0.202	-0.078
Investment	0.763	0.249	0.111	1	0.515	0.595	0.384	0.009
Net FDI	0.262	0.057	0.018	0.515	1	0.471	0.086	-0.010
Exports	0.486	0.242	0.052	0.595	0.471	1	0.183	0.018
Loans	0.072	0.077	0.202	0.384	0.086	0.183	1	-0.062
PPZ	0.038	-0.071	-0.078	0.009	-0.010	0.018	-0.062	1

Common Sample Correlation

	Saving	Remittances	Aid	Investment	Net FDI	Exports	Loans	Portfolio Flows
Saving	1	0.154	0.074	0.782	0.231	0.519	0.076	0.039
Remittances	0.154	1	0.324	0.249	0.060	0.245	0.076	-0.108
Aid	0.074	0.324	1	0.166	-0.065	0.015	0.262	-0.114
Investment	0.782	0.249	0.166	1	0.407	0.584	0.382	0.018
Net FDI	0.231	0.060	-0.065	0.407	1	0.493	0.024	-0.036
Exports	0.519	0.245	0.015	0.584	0.493	1	0.148	-0.083
Loans	0.076	0.076	0.262	0.382	0.024	0.148	1	-0.064
Portfolio Flows	0.039	-0.108	-0.114	0.018	-0.036	-0.083	-0.064	1

Sources: WDI Online 2005, GDF Online 2005.

Table A.3.1 The Determinants of School Enrollment By Gender

Dependent Variable: Log of the Gross Primary Enrollment Rate				
Gender	Male		Female	
Estimation Method:	OLS-FE [1]	IV-FE [2]	OLS-FE [1]	IV-FE [2]
(White robust errors t-statistics)				
Log of Total Gross Primary Enrollment Rate	**0.52**	**0.55**	**0.56**	**0.68**
(Previous 5 yr period)	(5.9)	(5.0)	(6.1)	(5.4)
Log of Adult Female Literacy Rate	**0.14**	**0.08**	**0.47**	**0.44**
(Previous 5 yr period)	(2.4)	(0.7)	(5.1)	(3.4)
Public Expenditures on Education as % of Public Budget	**0.01**	**0.003**	**0.01**	**0.004**
(Previous 5 yr period)	(2.7)	(0.2)	(3.2)	(0.3)
Exports as % of PPP GDP [3]	**0.003**	**0.0005**	**0.01**	**0.005**
(Previous 5 yr period)	(1.1)	(0.1)	(2.8)	(1.1)
Remittances as % of PPP GDP [3]	**0.03**	**0.04**	**0.02**	**0.04**
(Previous 5 yr period)	(5.8)	(2.3)	(3.4)	(3.6)
Aid as % of PPP GDP	**-0.01**	**-0.01**	**0.00**	**-0.01**
(Previous 5 yr period)	-(2.1)	-(1.5)	-(0.2)	-(1.0)
FDI as a % of PPP GDP	**-0.002**	**0.004**	**-0.01**	**-0.001**
(Previous 5 yr period)	-(0.3)	(0.5)	-(1.3)	-(0.2)
Constant	**1.64**	**1.74**	**0.05**	**-0.41**
	(6.6)	(4.6)	(0.1)	-(0.9)
Number of Countries	46	42	46	42
Numbers of Observations	154	127	154	127
Fixed Effects Likelihood ratio F-test [4]	2.6		2.5	
Prob. Value (%)	0%		0%	
Adjusted R-Squared	0.93	0.92	0.96	0.96
Mean of dependent Variable	4.6	4.6	4.4	4.5
St. Error of Regression	0.1	0.1	0.1	0.1

[1] Pooled Ordinary Least Squares with Country and Period Effects.

[2] Instrumental Variables with Country and Period Effects. Instruments include lagged exports, aid and FDI plus world total for these flows and total world remittances all as a % of PPP GDP.

[3] Exports and remittances were deflated by an import deflator as percent of real $PPP GDP. (source WDI and PWT 6.1)

[4] Likelihood ratio test for redundant "fixed" country and period effects.
I do not reject the null hypothesis that the effects are redundant unless both statistics do.

Table A.3.2 The Determinants of School Enrollment By Gender [1]

Dependent Variable:	**Log of the Gross Secondary Enrollment Rate**			
Gender	**Male**		**Female**	
Estimation Method:	**OLS-FE** [2]	**IV-FE** [3]	**OLS-FE** [2]	**IV-FE** [3]
(White robust errors t-statistics)				
Log of Total Gross Primary Enrollment Rate	**0.64**	**0.57**	**0.74**	**0.82**
(Previous 5 yr period)	(8.5)	(4.2)	(9.7)	(5.0)
Log of Adult Female Literacy Rate	**-0.09**	**0.07**	**0.22**	**0.51**
(Previous 5 yr period)	-(0.8)	(0.5)	(1.5)	(3.1)
Public Expenditures on Education as % of Public Budget	**0.01**	**0.09**	**0.01**	**0.11**
(Previous 5 yr period)	(2.0)	(2.4)	(3.6)	(2.7)
Exports as % of PPP GDP [4]	**0.0001**	**-0.01**	**0.0003**	**-0.01**
(Previous 5 yr period)	(0.02)	-(0.9)	(0.1)	-(1.2)
Remittances as % of PPP GDP [4]	**0.06**	**0.12**	**0.05**	**0.15**
(Previous 5 yr period)	(4.2)	(2.0)	(5.3)	(2.2)
Aid as % of PPP GDP	**-0.02**	**-0.04**	**-0.01**	**-0.04**
(Previous 5 yr period)	-(2.1)	-(1.6)	-(1.0)	-(1.2)
FDI as a % of PPP GDP	**-0.004**	**0.01**	**-0.02**	**0.003**
(Previous 5 yr period)	-(0.3)	(0.7)	-(1.8)	(0.1)
Constant	**1.21**	**0.60**	**-0.65**	**-2.47**
	(2.0)	(0.8)	-(1.1)	-(2.4)
Number of Countries	46	42	46	42
Numbers of Observations	154	127	154	127
Fixed Effects Likelihood ratio F-test [5]	12.6		12.6	
Prob. Value (%)	0%		0%	
Adjusted R-Squared	0.95	0.95	0.97	0.96
Mean of dependent Variable	3.8	3.8	3.6	3.6
St. Error of Regression	0.1	0.1	0.1	0.1

[1] Note that the regressions for secondary school enrollment include the previous five-year average of the primary school enrollment.

[2] Pooled Ordinary Least Squares with Country and Period Effects.

[3] Instrumental Variables with Country and Period Effects. Instruments include lagged exports, aid and FDI plus world total for these flows and total world remittances all as a % of PPP GDP.

[4] Exports and remittances were deflated by an import deflator as percent of real $PPP GDP. (source WDI and PWT 6.1)

[5] Likelihood ratio test for redundant "fixed" country and period effects.
I do not reject the null hypothesis that the effects are redundant unless both statistics do.

Table A.3.3 The Determinants of School Enrollment Two Regions

Dependent Variable:	**Log of the Gross Primary Enrollment Rate**			
Region	**Latin America**		**Asia and the Pacific** [1/]	
Estimation Method:	**OGLS** [/2]	**2SLS** [/3]	**OGLS** [/2]	**2SLS** [/3]
(White robust errors t-statistics)				
Log of Total Gross Primary Enrollment Rate	**0.61**	**0.73**	**0.45**	**0.22**
(Previous 5 yr period)	(20.2)	(14.6)	(6.0)	(1.8)
Log of Adult Female Literacy Rate	**0.22**	**0.11**	**0.17**	**0.34**
(Previous 5 yr period)	(12.4)	(3.3)	(3.5)	(2.9)
Public Expenditures on Education as % of Public Budget	**0.01**	**0.01**	**0.02**	**0.15**
(Previous 5 yr period)	(3.6)	(2.9)	(1.5)	(2.3)
Exports as % of PPP GDP [/4]	**-0.004**	**-0.003**	**-0.02**	**-0.043**
(Previous 5 yr period)	-(9.8)	-(4.3)	-(2.3)	-(2.2)
Remittances as % of PPP GDP [/4]	**0.01**	**0.03**	**-0.02**	**-0.01**
(Previous 5 yr period)	(4.3)	(3.0)	-(2.0)	-(0.3)
Aid as % of PPP GDP	**0.02**	**0.01**	**-0.02**	**-0.02**
(Previous 5 yr period)	(5.4)	(12.4)	-(3.3)	-(0.4)
FDI as a % of PPP GDP	**-0.001**	**0.004**	**0.06**	**0.10**
(Previous 5 yr period)	-(0.4)	(2.5)	(5.6)	(1.1)
Constant	**0.89**	**0.75**	**1.88**	**2.12**
	(5.4)	(4.2)	(7.9)	(6.4)
Number of Countries	20	19	9	7
Numbers of Observations	60	51	31	27
Adjusted R-Squared	0.94	0.95	0.90	0.94
Mean of dependent Variable	12.9	7.9	7.1	4.5
St. Error of Regression	0.1	0.1	0.1	0.1

[/1] Given limited data availability, the regressions for Asia and the Pacific should not be taken definitively. They are presented here for comparison purposes only.

[/2] Ordinary Generalized Least Squares with Cross section weights used.

[/3] Instrumental Variables with Country and Period Effects. Instruments include lagged exports, aid, and FDI plus world total for these flows and total world remittances all as a % of PPP GDP.

[/4] Exports and remittances were deflated by an import deflator as percent of real $PPP GDP. (source WDI and PWT 6.1)

Table A.3.4 The Determinants of School Enrollment Two Regions

Dependent Variable:	**Log of the Gross Secondary Enrollment Rate** [1]			
Region	**Latin America**		**Asia and the Pacific** [2]	
Estimation Method:	**OGLS** [3]	**2SLS** [4]	**OGLS** [3]	**2SLS** [4]
(White robust errors t-statistics)				
Log of Total Gross Primary Enrollment Rate	**0.38**	**0.29**	**0.80**	**0.89**
(Previous 5 yr period)	(1.3)	(0.7)	(3.9)	(4.6)
Log of Adult Female Literacy Rate	**1.03**	**1.08**	**0.43**	**0.33**
(Previous 5 yr period)	(3.3)	(2.9)	(5.1)	(4.8)
Public Expenditures on Education as % of Public Budget	**0.09**	**0.11**	**0.03**	**0.11**
(Previous 5 yr period)	(4.3)	(4.9)	(0.7)	(3.4)
Exports as % of PPP GDP [5]	**-0.01**	**-0.01**	**0.03**	**0.05**
(Previous 5 yr period)	-(2.2)	-(3.2)	(2.8)	(6.7)
Remittances as % of PPP GDP [5]	**0.03**	**0.02**	**0.08**	**0.05**
(Previous 5 yr period)	(2.0)	(1.4)	(6.6)	(2.8)
Aid as % of PPP GDP	**0.01**	**0.02**	**-0.10**	**-0.07**
(Previous 5 yr period)	(0.3)	(0.4)	-(3.9)	-(1.0)
FDI as a % of PPP GDP	**0.09**	**0.11**	**-0.47**	**-0.73**
(Previous 5 yr period)	(7.0)	(8.6)	-(3.3)	-(13.0)
Constant	**-2.60**	**-2.43**	**-1.55**	**-1.77**
	-(3.8)	-(3.2)	-(2.5)	-(2.9)
Number of Countries	20	19	9	7
Numbers of Observations	59	50	31	27
Adjusted R-Squared	0.91	0.79	0.96	0.98
Mean of dependent Variable	5.5	5.4	6.6	5.7
St. Error of Regression	0.2	0.2	0.2	0.1

[1] Note that the regressions for secondary school enrollment include the previous five-year average of the primary school enrollment.

[2] Given limited data availability, the regressions for Asia and the Pacific should not be taken definitively. They are presented here for comparison purposes only.

[3] Ordinary Generalized Least Squares with Cross section weights used.

[4] Instrumental Variables with Country and Period Effects. Instruments include lagged exports, aid, and FDI plus world total for these flows and total world remittances all as a % of PPP GDP.

[5] Exports and remittances were deflated by an import deflator as percent of real $PPP GDP. (source WDI and PWT 6.1)

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Remittances, Investment, and School Enrollment in Developing Countries

Dissertation directed by Darryl L. McLeod, PhD

Abstract: Remittances are an important source of foreign exchange earnings for many of the poorest developing countries. This dissertation develops an OLG model of households with residences in two countries to show how remittances may be either be saved for retirement, used to finance investment in housing, schooling, or simply consumed. The model provides several hypotheses regarding how remittances might affect household spending and investment decisions in the home country. These hypotheses are tested using panel data for 62 countries. A number of studies focus on the *determinants* of remittances (including Puri and Ritzema (1999), Chami, Fullenkamp, and Jahjah (2003), and Bouhga-Hagbe (2004)). However, it is only recently that the economic *effects* of remittances been studied empirically: Adams and Page (2003) use a cross section of countries to study the impact of remittances on poverty while and Rajan and Subramanian (2005) explore the impact for remittances and aid on growth. In particular, I use the theoretical framework of McLeod et al (2005), Kremer and Chen (2002) and Stark and Wang (2003), to develop the model. In the empirical analysis, I use the estimation framework Gruben and McLeod (1998),

Bosworth and Collins (1999), and Mody and Murshid (2002) to study the impact of remittances on savings and investment in a panel of 62 developing countries for which long remittances series are available and compose either over 2% of exports or imports or over 0.5% of GDP. In addition, I study the impact of remittances on school enrollments in that same panel of developing countries. The empirical results appear to be consistent with the model as remittances appear to have a weak but positive effect on Gross national Savings and Investment. Furthermore, the results show that Remittances positively affect primary school enrollment as well as secondary school enrollment. I use Instrumental variables as well as the Generalized Method of Moments to carry out robustness checks and to estimate the best unbiased coefficients in the long term in all cases. The conclusion offers a plea for more data availability regarding poverty and discusses the new ways of measuring remittances.

VITA

Juan José Molina Flores, son of Asunción Molina and Ana Maria Flores de Molina, was born and raised in El Salvador. He attended High School at the Instituto Católico de Oriente in San Miguel, El Salvador. He graduated with a Bachelor of Science Degree from Strayer University, Washington, DC, with Summa Cum Laude. He entered the Order of the Most Holy Trinity and was ordained a Priest in October of 1999. He did his Theology studies at the Washington Theological Union, Washington, DC, where he earned a joint MA/MDiv degree. He began his graduate studies in International Political Economy at Fordham University in 2000. While at Fordham, he interned at the United Nations and was a Peace and Development Fellow with Catholic Relief Services in Zimbabwe. Juan graduated with an MA in International Political Economy and Development in August of 2002. He continued his studies for the Ph.D. in Economics at Fordham since then.

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