REMITTANCES, INVESTMENT, AND INEQUALITY
IN DEVELOPING COUNTRIES

BY

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DISSERTATION PROPOSAL
SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY
IN THE DEPARTMENT OF ECONOMICS
AT FORDHAM UNIVERSITY

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NEW YORK
APRIL, 2005
Abstract: Remittances are an important source of foreign exchange earnings for many of the poorest developing countries. For this reason, a number of studies including Puri and Ritzema (1999), Chami, Fullenkamp, and Jahjah (2003), and Bouhga-Hagbe (2004) focus on the determinants of remittances. This dissertation models remittances as a transfer within a “multi-national” family for which remittances may be either be saved, used to finance investment in housing or schooling for example or simply consumed. The model provides several hypotheses regarding how remittances might affect household spending and investment decisions in the home country. In particular, we use the estimation framework of Gruben and McLeod (1998), Bosworth and Collins (1999), Mody and Murshid (2002) and especially Bouhga-Hagbe (2004) to study the impact of remittances on savings, investment and growth rates in a panel of 62 developing countries for which long remittances series are available and compose either over 5% of exports or imports or over 2% of GDP. Where remittances are large relative to exports, they may also affect the real exchange rate and the
trade balance. Where remittances are large with respect to imports, they finance a trade balance deficit. Finally, we can regress income by deciles and quintiles on remittances to investigate which household groups appear to benefit most from remittances compared to other sources of foreign exchange, including exports, aid grants and other capital inflows and transfers.
1. Introduction

Remittances, what foreign workers send back to their home countries, have grown not only in size, but 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 the world at 23.6 billion US Dollars. This amount had almost tripled to 63.7 billion in 2003, the latest year of available data. Thus, remittances have become an important source of foreign exchange for many developing countries. Graph One shows the behavior of remittances since 1970. Yet, the story is not as clear for all countries. The share of remittances on GDP for the world has fallen, from an estimated 4.01 per cent in 1970 to less than one per cent in 2003. 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 2.5% of GDP, we are able to see how these remittances have acquired great importance for the economic wellbeing and development of these countries. For the 62 countries I study 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. Studying why remittances have increased in these countries is worthy of study. Studying how these remittances impact the economic life of these countries is of most
importance, especially as the shares of savings, consumption, and investment on GDP change due to the inflows of foreign exchange. The impact of these inflows on poverty and the income distribution in a given country are also interesting and worthwhile.

Table One: Total World Remittances
($Billions of constant 2000 dollars)

<table>
<thead>
<tr>
<th>Year</th>
<th>Remittances</th>
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</thead>
<tbody>
<tr>
<td>1970</td>
<td>$0</td>
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<tr>
<td>1971</td>
<td>$10</td>
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<tr>
<td>1972</td>
<td>$20</td>
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<td>1976</td>
<td>$60</td>
</tr>
<tr>
<td>1977</td>
<td>$70</td>
</tr>
</tbody>
</table>

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.

In this paper, I analyze the impact of remittances on the shares of savings and investment on GDP using pooled data from 62 developing countries. The data come from the *World Development Indicators* and from the *Global Development Finance* both online. I use three year averages for the period 1970-2003. A long-standing “stylized fact” about remittances is that they increase consumption but do not increase savings and investment in an important way. That is, that the recipients of remittances use this extra income to simply spend it on consumption. This does not seem corroborated by the data, as I show in the regressions presented below. I also study the impact that remittances have on a developing country’s growth. Here the story is not as clear and as simple as it looks. I present some results and give

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1 For example, Shivani Puri and Tineke Ritzema, present a paper titled “Migrant Worker Remittances, Microfinance 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.
some possible analysis of these results. Finally, I also study the impact on poverty and income distribution that remittances have. One reason why this is important is that most 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. The analysis in this part of the paper does not provide clear answers either. The analysis gets more complicated when I try to introduce the idea that migrants may be investing in education. The reason is that secondary and school enrollment does not seem to be influenced by remittances even when they are introduced with a lag.

The paper is divided as follows. In part two, I review the literature on remittances. Many authors have stated that most of the literature on remittance is anecdotal and very few academic papers have been written on the subject. The literature on remittances is vast but not rigorous enough to provide much basis for modeling economic analysis. In part three, I present a simple model which can be used to analyze the impact of remittances on savings, investment and poverty in developing countries. 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. In part four, I present the data and the empirical results as well as offer some explanations for the results obtained. Finally, in the conclusion I summarize the results and offer some possibilities for future research and some policy implications.

2. The Literature on Remittances

Most of the papers focusing on remittances are 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. The literature that acknowledges 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. The findings 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 kinds of theories: those that explain remittances as an “endogenous” result of migration, in the sense that the member of the family who moves abroad and remits does so either for altruistic or self-interested reasons; and those that try to explain remittances as a migrant’s desire to invest in the home county as a result of a “portfolio” decision. 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. 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,”

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2 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.

3 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 Policy Institute in her paper “Migrant Remittances to Latin America: Reviewing the Literature,” present very good contemporary surveys of the literature.
devoted a section to “Workers’ Remittances Trend and Prospects.” The 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 were 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 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. I use Bouhga-Hagbe’s model as a basis for my model in the next section.

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 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.

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. I propose a model in which a “multinational” family is considered not only as a one-member household but a family composed of the two spouses. 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 have to make labor, education, and savings decisions that affect more than one country.
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. 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. 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 Model and its implications.

The Production function follows the neoclassical model with an augmented Cobb-Douglas production function:

$$Y_t = K_t^\alpha (A_t L_t)^{1-\alpha}$$  (3.1)

with $0 < \alpha < 1$ and $A_t$ is a parameter that enhances human labor.

The investment technology:

$$K_{t+1} = (1-\delta) K_t + I_t$$  (3.2)

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4 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.
with $0 < \delta < 1$ and $\delta$ is the depreciation rate

And the resource constraint is:

$$Y_t = H_t + I_t$$  \hspace{1cm} (3.3)

The representative international household’s (husband and wife) income is composed of:

$$w^a - R + w^d + rk^d + eR$$  \hspace{1cm} (3.4)

Where $w^a$ is the wages of the member of the household who works abroad (the migrant), expressed in US dollars. $R$ is the amount of remittances the migrant sends back to the other member of the household in the home country, expressed in US dollars; $w^d$ is the wages the member of the household who lives in the home country earn, expressed in the domestic currency; $e$ is the exchange rate, expressed as the amount of domestic currency per US dollar. $r$ is the real interest rate in the home country, expressed in percentage terms, and $k^d$ is the total assets of the household in the home country, expressed in domestic currency.

The household maximizes the following:

$$\sum_{t=0}^{\infty} \beta^t U(h_t)$$  \hspace{1cm} (3.5)

With

$$h_t = c_t^a + c_t^d + \alpha E_t^d + \gamma \phi_t + \theta q_t$$  \hspace{1cm} (3.6)

Where $\beta$ is equal to $\frac{1}{1 - \rho}$ and $\rho$ is the discount rate. $c_t^a$ is the consumption of the migrant abroad; $c_t^d$ is the consumption of the household member in the home country; $E_t^d$ is the expenditures on education for the household member in the home country. $\phi_t$ is the household’s expenditures in helping their parents in their old age. $q_t$ is the household’s expenditures in improving their physical assets in the home country (expenditures in
improving living conditions or living facilities); this, then, is a form of investment in physical
capital in the home country. $\alpha$, $\theta$, and $\gamma$ are parameters that are between zero and one. $\alpha$
represents the degree of interest the household has in the education of at least the member of
the household who stays in the home country. $\theta$ can be thought of as the degree of
“attachment” of the household to their home and other physical plant assets in their home
country and in particular as the attachment to the home country by the migrant. $\gamma$ can be
thought of as the degree of “altruism” of the household or the migrant who remits money to
his or her parents.

Therefore the resource constraint of the household is:

$$ h_t + k_{t+1} = w^d - R + w^d + (1 + r_t)k^d + eR $$

(3.7)

Notice some general aspects of the model:

While not directly modeled here, $A_t$ is affected by $E_t$, the expenditures in education in at least
the home country. The exchange rate provides a certain “arbitrage” for the family to increase
the value of the remittances from abroad to the home country, thus increasing the household’s
total wealth.

If we talked about $E^d_t$ as the household’s expenditures in the children’s education, we
could introduce $n$ as a measure of population growth. By keeping the model as representing a
household with only “a husband and wife” we avoid some algebra and get the basic results of
the model. Here instead we use $E^d_t$ as the expenditures on education of the household
member in the home country.

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, consumption, growth and the social indicators of primary and secondary school enrollment. 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. Thus, while some of the variables seem to be the same, the actual values are not as they come from different sources. 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. 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. Data for one of the inequality measures comes from the University of Texas International Poverty and Inequality database. Other data on poverty and inequality comes from the World Bank’s (now defunct) Poverty Net database. This World Bank’s database was shut down to encourage researches to use the World Bank’s new program on Poverty and Inequality called Povcal Net. The program allows researchers to set their own poverty lines and see the results online. After the results are shown, one can then copy them to a file. The data as is presented in the new website is more difficult to handle to make calculations for all countries, so I have chosen to stay with the old data as it allows me to put all countries and available years together and make the necessary comparisons.

For the main results from the regression, 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. Using the twelve three-year period averages affords over 500 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. The results tables present the number of data points that where actually used to compute the calculations.

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.

4.2 Basic Descriptive Statistics and Outlier Detections.

On Remittances. Using ten year averages, the summary descriptive statistics for remittances as a share of PPP GDP are presented in table one. The table reports the adjusted and unadjusted series. The series show an interesting pattern: the unadjusted (nominal) series shows an increase in the share of remittances while the adjusted (deflated) series shows a small decline in the share of remittances on PPP GDP.

On the Savings and Investment shares. Both 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 which 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. This is what the regressions will uncover—the source of financing for persistent current account deficits.

<table>
<thead>
<tr>
<th>Share of Nominal Remittances on PPP GDP for 62 Developing Countries</th>
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<tbody>
<tr>
<td>Mean</td>
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<tr>
<td>Standard Error</td>
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<tr>
<td>Median</td>
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<tr>
<td>Standard Deviation</td>
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<td>Sample Variance</td>
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<td>Count</td>
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<tr>
<th>Share of Constant (2000) Remittances on PPP GDP</th>
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</thead>
<tbody>
<tr>
<td>Mean</td>
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<tr>
<td>Standard Error</td>
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<tr>
<td>Median</td>
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<tr>
<td>Standard Deviation</td>
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<tr>
<td>Sample Variance</td>
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<td>Count</td>
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</table>

Note: Unadjusted series are from WDI online and divided by the PPP GDP as presented also in the WDI Online. The adjusted series were deflated by the US Wholesale price index to account for the actual purchasing power of remittances.

Worthy of noticing is the fact that the savings series shows an irregularity the 1990s and the 2000s. Ecuador is the country that shows an increase in savings of over a thousand percent. Simply taking Ecuador out of the calculations gives another picture: the share of savings actually declines from 18.01 in the 1990s to 16.19 in the early 2000s. This seems to be another puzzle that will have to be solved in the regressions. One initial explanation can be that since countries had to do without much of the loan financing from the late 1970s, the share of savings had to decline to give way to a slight increase in investment and a persistent current account deficit. What occurred with Ecuador would be for future research. But simply taking Ecuador’s data out of the regressions causes the statistics and the estimation to be

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5 The countries included in this study are: Albania, Argentina, Azerbaijan, Benin, Burkina Faso, Bangladesh, Bosnia and Herzegovina, Belize, Bolivia, Brazil, Barbados, China, Colombia, Comoros, Cape Verde, Costa Rica, Dominica, Dominican Republic, Algeria, Ecuador, Egypt, Georgia, Guatemala, Guyana, Honduras, Croatia, Haiti, India, Jamaica, Jordan, Kyrgyz Republic, Cambodia, St. Kitts and Nevis, Lebanon, St. Lucia, Sri Lanka, Morocco, Madagascar, Mexico, Macedonia, Mali, Myanmar, Mongolia, Niger, Nigeria, Nicaragua, Nepal, Pakistan, Peru, Philippines, Paraguay, Sudan, Senegal, El Salvador, Togo, Tonga, Trinidad and Tobago, Tunisia, Turkey, Vanuatu, Western Samoa, and Yemen. Not all countries show all observations, therefore statistics and regressions depend on available data.
more realistic regarding the coefficients of specially the remittances and foreign direct investment variables. Also, the statistical significance of these coefficients increases.

**On poverty and inequality.** Using ten year averages, the summary descriptive statistics for poverty and inequality are presented in table two. The summary statistics presented here are for the Gini coefficients calculated by the University of Texas Inequality Project. One downside of these data is that some of the measures for the 1990s have increased. One reason for this is not only the rise in inequality in the 1990s in some parts of the world, but also because the UTIP data weighs in wage inequality and thus this causes a bit of a rise in the Gini coefficient. Yet, the measure does capture much of what is going on in the countries involved. As expected, inequality has increases in most countries, although the most recent literature argues that inequality has been declining in the 2000’s is some countries.

Unfortunately, data on inequality for the 2000’s is not available from UTIP.

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<tr>
<td>Mean</td>
<td>44.87</td>
<td>44.04</td>
<td>46.04</td>
</tr>
<tr>
<td>Standard Error</td>
<td>0.72</td>
<td>0.76</td>
<td>0.76</td>
</tr>
<tr>
<td>Median</td>
<td>45.67</td>
<td>43.85</td>
<td>46.80</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>4.19</td>
<td>4.92</td>
<td>4.83</td>
</tr>
<tr>
<td>Sample Variance</td>
<td>17.56</td>
<td>24.25</td>
<td>23.33</td>
</tr>
<tr>
<td>Count</td>
<td>34</td>
<td>42</td>
<td>40</td>
</tr>
</tbody>
</table>

*Note: Data on inequality is not available for the 2000’s from the UTIP.*

**On GDP Growth.** I use, for the main results, the growth of GDP at market prices based on constant local currency and converted to constant 1995 dollars. First thing to notice regarding GDP growth is the decline in the average rate of growth for the 62 developing countries in this study. The lowest growth period was the 1980s, the period of sudden stop in bank financing in most developing countries. There is at least a negative growth of –42.45, which also highlights how difficult a time the 1980’s was. One question that can be asked is whether the rising importance of remittances at around this same time prevented some countries from


experiencing even greater decline or if the contrary was the case—whether remittances deepened the decline or accelerated it. Trying to solve this question by way of the econometric analysis will also be important. Some emerging research on this argues that the decrease in growth would have been even larger in many developing countries had it not been for the opening and labor migration effects of globalization.

4.2 The independent variables and the dependent variable.

I present several regressions that link the dependent variables to a host of independent variables. 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. 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 effects. In the dissertation, I will use instrumental variables to relate variables that are otherwise difficult to relate and to take care of causality and endogeneity issues. I will also construct a Vector autoregression to deal with lags and spurious regressions. The reason for this is also that even when we simply regress remittances on some of the know variables that influence their levels, the results are not very encouraging. For example, one regression on the log of US wages, local wages, the exchange rate index, the real interest rate in the country and inflation in the country give an R-square of 0.097 and gives a positive and significant coefficient for the local wages, a positive but insignificant coefficient for the US wages yet surprisingly makes the real interest rate small, negative and significant. The expected sign for the real interest rate would be positive and significant.
4.3 The fitted regressions.

On the shares of GDP and the financial flows including remittances.

For all the regressions analyzed here, I use the share of deflated remittances (with the US Wholesale Price index using 2000 as the base year) on PPP GDP as the variable of interest as well as other financial flows. Following Mody and Murshid, I also use three year averages instead of yearly data. This allows us to abstract from some of the business cycle turns.

It is interesting to note, first, that the share of savings on GDP regression shows remittances to be positive and significant. The coefficients, however, are unrealistic when we include Ecuador and there is no variable that is statistically significant. In addition the R-square is very low, showing that there is very little that is explained by the relationship as it is specified with the data used.

More realistic results excluding Ecuador are presented in table three below for the shares of savings, investment, and secondary school enrollment. The table presents results using a Generalized Least Squares regression with cross-weights to allow for cross-section heteroskedasticity as well as results from a pooled Ordinary Least Squares regression using both cross- and period- effects. The regressions considered the effect of the lag independent variables on the contemporary dependent variable. As in the previous one, I use three-year averages for this regression. The results are telling and interesting. Remittances are positive with and without effects and the generalized least squares method with cross weights. They are positive and significant at the five and ten percent level with cross-sectional and period effects. The lagged share of FDI is positive in all but two specifications and significant only for investment and secondary school enrollment using GLS. I believe this is explained by the fact that individual country experiences matter. For example, in a country like Mexico,
remittances are a small percentage of GDP compared to FDI and so FDI is more significant than remittances (even though remittances as a volume of dollars is huge for Mexico). However, for a small country like El Salvador, remittances are more significant than FDI, as El Salvador does not attract as much FDI as Mexico does.

One thing to also notice in the specifications is that while in some specifications FDI as a percent of GDP is not significant and remittances are, the sign of FDI does change. This is an interesting result and may need to be studied further for these countries.

The role of aid in investment is also interesting. For example, with fixed effects, aid is positive but not significant. In a GLS regression, Aid is positive and significant. This allows us to conclude that the role of aid is ambivalent and not robust to different specifications.

Table 3.
Regression Results (Three year averages)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Investment</th>
<th></th>
<th>Savings</th>
<th></th>
<th>Secondary Schooling</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EGLS</td>
<td>Effects</td>
<td>EGLS</td>
<td>Effects</td>
<td>EGLS</td>
<td>Effects</td>
</tr>
<tr>
<td>Intercept</td>
<td>19.56</td>
<td>20.69</td>
<td>17.62</td>
<td>14.64</td>
<td>45.76</td>
<td>47.96</td>
</tr>
<tr>
<td>(48.97)</td>
<td>(30.15)</td>
<td>(56.50)</td>
<td>(18.66)</td>
<td>(27.04)</td>
<td>(121.61)</td>
<td></td>
</tr>
<tr>
<td>Share of Remittances</td>
<td>0.41</td>
<td>0.35</td>
<td>0.27</td>
<td>0.35</td>
<td>1.10</td>
<td>0.50</td>
</tr>
<tr>
<td>(7.99)*</td>
<td>(2.85)*</td>
<td>(3.36)*</td>
<td>(2.62)*</td>
<td>(4.71)*</td>
<td>(3.42)*</td>
<td></td>
</tr>
<tr>
<td>Share of FDI</td>
<td>0.37</td>
<td>-0.27</td>
<td>0.24</td>
<td>0.02</td>
<td>3.34</td>
<td>-0.13</td>
</tr>
<tr>
<td>(2.82)*</td>
<td>(-2.71)*</td>
<td>(1.82)</td>
<td>(0.13)</td>
<td>(9.90)*</td>
<td>(-0.90)</td>
<td></td>
</tr>
<tr>
<td>Share of Loans</td>
<td>0.20</td>
<td>0.27</td>
<td>-0.15</td>
<td>0.22</td>
<td>-0.57</td>
<td>0.36</td>
</tr>
<tr>
<td>(2.62)*</td>
<td>(1.91)</td>
<td>(-2.09)*</td>
<td>(1.32)</td>
<td>(-1.05)</td>
<td>(2.42)*</td>
<td></td>
</tr>
<tr>
<td>Share of Aid</td>
<td>-0.17</td>
<td>0.004</td>
<td>-0.50</td>
<td>0.10</td>
<td>-1.97</td>
<td>-0.99</td>
</tr>
<tr>
<td>(-2.66)*</td>
<td>(-0.02)</td>
<td>(-8.34)*</td>
<td>(0.58)</td>
<td>(-4.30)*</td>
<td>(-5.53)*</td>
<td></td>
</tr>
<tr>
<td>Share of Portfolio</td>
<td>1.35</td>
<td>0.40</td>
<td>1.09</td>
<td>-0.19</td>
<td>10.47</td>
<td>-0.20</td>
</tr>
<tr>
<td>(2.50)*</td>
<td>(0.80)</td>
<td>(2.69)</td>
<td>(-0.22)</td>
<td>(3.49)</td>
<td>(-0.07)</td>
<td></td>
</tr>
<tr>
<td>R-squared</td>
<td>0.87</td>
<td>0.72</td>
<td>0.89</td>
<td>0.71</td>
<td>0.87</td>
<td>0.94</td>
</tr>
<tr>
<td>Observations</td>
<td>360</td>
<td>360</td>
<td>332</td>
<td>332</td>
<td>263</td>
<td>263</td>
</tr>
</tbody>
</table>

Notes:
Items (besides the intercept) with an * are significant at the five percent level.
All variables are in the first lag.
Data on the Financial Flows comes from the GDF and are in shares of current GDP.
Data on Remittances comes from the WDI, are deflated by the US Wholesale Price Index, and are in shares of PPP GDP.
EGLS is the OLS estimation with cross-weights.
“Effects” refers to the pooled OLS estimation using both cross- and period- effects.
With regards to savings, Aid is negative and significant in the GLS specification; remittances are positive and significant while FDI is not. Adding effects to the specification for savings, remittances stay positive and significant, FDI positive but insignificant, and aid small but also insignificant.

Introducing school enrollment as dependent on remittances and other variables gives a clear picture. The model presented in this paper does as well in explaining the impact of remittances on education therefore. Lagged remittances appear to be very influential on secondary schooling and significant. So is also lagged FDI if we use GLS yet negative but not significant if we use pooled OLS with both fixed effects.

Adding other variables to the regressions (that is, to the basic model) does change the main results in some of the specification and estimation methods used. Using the government budget as a percent of GDP, bank liquid reserves to bank assets ratio of and the money supply (Money and quasi-money as a percent of GDP), and the log of the exchange rate index makes some of these variables significant depending on the specification used.

However, once we introduce these variables, the sign and significance of remittances and FDI changes in some of the specifications. For example, remittances are positive and significant for savings and for investment in most specifications. FDI and loans are positive and not significant in some specifications and positive and significant in others. These results confirm the initial statement that the role of remittances on savings and investment is ambivalent as their impact is not robust to specifications.

**On Poverty and inequality and the impact of remittances on Poverty and inequality.**

With respect to inequality and using the Gini coefficient as calculated by the UTIP, FDI is significant at the five percent level but not at the ten percent level. The lag of FDI is also positive and significant, which means that FDI increases inequality. This is expected since FDI goes to the sectors that by themselves already increase inequality in a country.
Remittances, are also positive but insignificant contemporaneously but negative and still insignificant in the lag. Loans, the real exchange rate index and the government deficit are all negative for inequality (which ironically means they reduce inequality). However, remittances, FDI, and the government budget become (or stay) negative with the lag. The other variables that are significant for inequality are aid and linguistic fractionalization. These two remain positive and significant at the five percent level.

**On GDP growth and the inclusion of remittances.** If we use the three year averages, including remittances in the growth equation shows remittances to be negatively related to growth contemporarily. Including Ecuador in the regressions shows that while remittances are negatively correlated with growth, that relationship is not statistically significant at any level. However, once we include a lag or more in the equation, the signs and the significance of remittances on growth changes.

Taking Ecuador out of the picture shows a much more complicated but rich story in the different estimation methods. Remittances are initially negative but insignificant, and then they become positive and significant with the lag. The R–square improves. If we add more lags to some of the variables to the growth equation, the R-square improves and remittances stay positive but insignificant. To deal with this issue of several lags, I will use a Vector Auto Regression in the dissertation in all the specifications.

Three year averages, however, do not give a clear picture of the long run effects of remittances on growth. Thus, I also computed some regressions using different lagged variables and their effect on growth but with ten year averages. In this regression, lagged remittances are seen as having a positive small but insignificant. Aid appears to have a negative and significant effect on growth but this result depends on the regression method used. Thus, we can conclude that the role of aid in growth and development is ambivalent.
Including other variables such as the supply of money in the economy (M2 as percent of GDP), bank liquidity (the liquid reserves over the bank assets ratio), and the real interest rate does not change the results for the variables of interest. The supply of money is positive but not significant for growth in the long run. Bank liquidity and the real interest rate are positive but not significant at any level.

**Other Effects and variables.** Adding regional variables also presents interesting results for the different regions. Savings are positively affected by remittances in Africa but the regional dummy decreases savings in that part of the world. Lagged remittances decrease savings in Africa. In Latin America, investment is positively and significantly increased by remittances contemporaneously but the region affects investment negatively. In addition, the lag of remittances negatively and significantly affects investment. Aid also becomes negative for investment in the region contemporaneously but it is positive in the lag although not significant.

For school enrollment, the age dependency ratio also lowers secondary schooling, which may mean that young people are forced quickly to find a job to support their ailing parents or young children. Liberalization of the capital account appears to be significant and negative at the five percent level when it enters into the secondary schooling regression. One other variable that enters significantly and is positive on secondary schooling is the recently introduced linguistic fractionalization measure by Alesina, et al. (2003). While their measure of ethnic fractionalization is positive but not significant, their measure of linguistic fractionalization is big (27.53) and significant (4.24). The R-squared in this regression is 0.86, meaning that the specification explains a good portion of what is going on.

The results for tertiary schooling are similar to those for secondary schooling. Remittances are positive but not significant in the GLS estimation; they are negative but not significant in the lag in the fixed effects estimation. Loans are positive but not significant as
is FDI. Liberalization of the current account appears to be negative and significant at the five percent level while liberalization of the capital account is positive but not significant. Linguistic fractionalization again appears to have a high and significant impact. This may mean that the high level of linguistic fractionalization that may exist in the country may actually encourage individuals to seek education as they see it as one of the few routes to social inclusion. Ironically, the expenditures on tertiary schooling, while not significant but negative for secondary schooling are negative and significant for tertiary schooling. As for secondary schooling, the initial level of per capita income appears small but positive and significant. The results for some of these variables and their significance depend on the specification used, however, so no clear conclusions can be reached.

5. Conclusion and Final Remarks.

I have presented some 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. 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. The studies that have focused on the positive aspect of remittances are few and focusing only on specific countries. I have tried to go further with this later kind of studies and thus have extended a maximization model to include not just one individual but a household and have
also applied that model to a set of countries for which remittances are an important source of
foreign exchange.

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 and encouraging. While not robust to all specifications, the impact of remittances
seems to be in general positive and important, especially to the saving and investment
behaviors of households. The role of remittances in growth and inequality is not significant
but seem to indicate that they do have a positive influence in the 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. For example, while I only touch upon the effect of remittances on school
enrollment, the effect of remittances on child labor would be interesting to study. And here is
where the implications for policy may also be important. Countries can encourage workers
remitting foreign exchange by showing them how children’s education can be improved or
extended by their remittances. Developing programs that directly link those remitting to
schools or other social institutions would also yield important results.
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