ECONOMICS OF REMITTANCES
ESSAYS ON THE EFFECTS OF REMITTANCES ON INEQUALITY AND GROWTH

A THESIS IS SUBMITTED TO THE UNIVERSITY OF MANCHESTER FOR THE DEGREE OF PhD IN THE FACULTY OF HUMANITIES

2011

AZIZUN NESSA
SCHOOL OF SOCIAL SCIENCE
TABLE OF CONTENTS

DECLARATION 8
ABBREVIATION 11
INTRODUCTION 12
CHAPTER 1 17
DYNAMIC EFFECTS OF MIGRANTS’ REMITTANCES ON INEQUALITY AND INCOME DISTRIBUTION 17
  1.1 Introduction 17
  1.2 Remittances, Inequality, and Income Distribution 18
  1.3 Aims and Contributions of this Study 22
  1.4 Models of Income Inequality Based on Capital Market Imperfection 23
  1.5 The Benchmark Model 25
    1.5.1 Eligibility for Loans 27
    1.5.2 Dynamics of Income Distribution 28
  1.6 An Economy with Remittances from Children to Parents 30
    1.6.1 Eligibility for Loans 31
    1.6.2 Dynamics of Income Distribution 31
  1.7 Remittances from Children to Siblings 32
    1.7.1 Eligibility for Loans 33
    1.7.2 Dynamics of Income Distribution 34
  1.8 Endogenising Migration 35
  1.9 Concluding Remarks 39
CHAPTER 2 43
WHEN REMITTANCES ACCELERATE ENTREPRENEURIAL ACTIVITY? 43
  2.1 Introduction 43
  2.2 Literature Review 44
  2.3 Regional Observations on Flow of Remittances 47
  2.4 Country-specific Observations on Flow of Remittances 49
  2.5 Macroeconomic Performances of LAC 50
  2.6 Microeconomic Performances of LAC 52
    2.6.1 Descriptive Statistics (Remittance Sender) 53
2.6.2 Descriptive Statistics (Remittance Receiver) 54
2.7 Empirical Model Specification Issues 56
2.8 Econometric Issues 58
2.9 Results 60
2.10 Concluding Remarks 67

APPENDIX I
LAMP Household Survey Data 88

APPENDIX II
Variable Definitions 89
Country Groupings 89

APPENDIX III
Bivariate Probit Model and Recursive Bivariate Probit Model 90

APPENDIX IV
Probit Model, Marginal Effect, and Total Marginal Effect 91

CHAPTER 3
AID VERSUS REMITTANCES: WHICH WORKS BETTER? 93

3.1 Introduction 93
3.2 Literature Review 97
  3.2.1 Aid-growth Literature: 97
  3.2.2 Remittance-growth Literature 100
3.3 Empirical Methodology and Strategy 103
  3.3.1 Panel’s Characteristics 104
  3.3.2 DFE, MG and PMG Estimator 105
  3.3.3 Dynamic GMM Estimator 107
3.4 Data Collection and Generation 108
3.5 Regression Results 110
  3.5.1 Results from PMG Estimation and Robustness Check 110
  3.5.2 Results from GMM Estimation and Robustness Check 114
3.6 A Theoretical Model on Aid and Remittances 116
  3.6.1 The Basic Framework 117
  3.6.2 An Economy with Aid 121
  3.6.3 An Economy with Remittances 122
LIST OF FIGURES

Figure 1-1 Transition of Lineage Wealth (An Economy without Remittance) .................41
Figure 1-2 Transition of Lineage Wealth (Remittance from Children to Parents) ..........41
Figure 1-3 Transition of Lineage Wealth (Remittance from Children to Siblings) ...........42
Figure 1-4 Endogenising Migration (Remittance from Children to Siblings) ...............42
Figure 2-1 Remittances (Billion US$) ............................................................................70
Figure 2-2 Growth (%) of Remittances ...........................................................................70
Figure 2-3 Remittances-GDP Ratio ..............................................................................70
Figure 2-4 Remittances-Export Ratio ............................................................................70
Figure 2-5 Remittances Over the Years (Billion US$) .....................................................70
Figure 2-6 Remittances in three decades (Billion US$) ..................................................70
Figure 2-7 Overall Macroeconomic Observation ............................................................71
Figure 2-8 Growth (%) of Capital Flows to LAC ............................................................71
Figure 2-9 Capital Flows to LAC (Billion US$) ...............................................................71
Figure 2-10 Capital Flows to LAC (% of Total) ..............................................................71
Figure 2-11 Volatility of Different Capital Flows to LAC ............................................... 71
Figure 2-12 Number of Foreign Born in the US .................................................................71
Figure 2-13 Migrants from LAC to USA .......................................................................... 72
Figure 2-14 Remittance Flow to Different LAC ...............................................................72
Figure 2-15 Remittance as a % of GDP in LAC ...............................................................72
Figure 2-16 Remittance as a % of Export in LAC .............................................................72
Figure 2-17 Growth of Remittances (% of GDP) in LAC ..................................................72
Figure 2-18 Volatility of Remittances in LAC (1990-08) ..................................................72
Figure 3-1 Low and Middle Income Countries (i) GDP Growth (ii) Capital Flows at Level and (iii) Capital Flows as Share of GDP (iv) Annual % Growth of Capital Flows and (v) Volatility of Capital Flows ...........................................................................126
Figure 3-2 Middle Income Countries - (i) GDP Growth (ii) Capital Flows at Level and (iii) Capital Flows as Share of GDP (iv) Annual % Growth of Capital Flows and (v) Volatility of Capital Flows ..................................................................................127
Figure 3-3 Low Income Countries - (i) GDP Growth (ii) Capital Flows at Level and (iii) Capital Flows as Share of GDP (iv) Annual % Growth of Capital Flows and (v) Volatility of Capital Flows ...........................................................................128
Figure 3-4 Effect of Corruption .......................................................................................133
Figure 3-5 Full Sample: 122 Low and Middle Income Countries ....................................150
Figure 3-6 Sample Used for Analysis: 42 Low and Middle Income Countries ...............151
Figure 3-7 Detection of Missing Values ..........................................................................152
Figure 3-8 Linear Approximation of Missing Values ......................................................153

List of Tables
Table 2-1 Macroeconomic Indicators ..............................................................................73
Table 2-2 LAMP Data (Number of Communities and Household Interviewed) .......... 76
Table 2-3 Microeconomic Indicators (Remittance Sender) .............................................77
Table 2-4 Microeconomic Indicators (Remittance Receiver) ..........................................78
Table 2-5 Recursive Simultaneous Bivariate Probit ....................................................... 80
Table 2-6: Probit Regression .........................................................................................84
Table 2-7 Probit Regression (Dummies for Size of Remittances Relative to Income) .... 86
ABSTRACT

There exists much controversy as to whether international migration in general, and migrant’s remittances in particular, increase or decrease economic welfare at origin. Our research contributes to the international discussion on remittances by presenting novel insights on the basis of theoretical and empirical analysis. Analysis of remittances from macro-economic as well as micro-economic point of view reveals that remittances not only have growth enhancing effect but also have an equalizing impact on income distribution of the recipient economy. The first chapter shows how large flows of remittances not only help the receiver to accumulate necessary savings but also reduce the critical level of wealth needed to get access to the capital market to instigate entrepreneurship. The second chapter reveals that the measured impact of remittances on business investment have significant country heterogeneity; remittances facilitate entrepreneurship in those countries where the lenders of the capital market can predict smooth and increasing flow of remittances. The third chapter proposes that remittances work better than aid in enhancing growth of the recipient country and the reason is that remittances are more effective than aid in augmenting capital accumulation.
DECLARATION

No portion of the work referred to in the thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning;
COPYRIGHT INFORMATION

i. The author of this thesis (including any appendices and/or schedules to this thesis) owns certain copyright or related rights in it (the “Copyright”) and s/he has given The University of Manchester certain rights to use such Copyright, including for administrative purposes.

ii. Copies of this thesis, either in full or in extracts and whether in hard or electronic copy, may be made only in accordance with the Copyright, Designs and Patents Act 1988 (as amended) and regulations issued under it or, where appropriate, in accordance with licensing agreements which the University has from time to time. This page must form part of any such copies made.

iii. The ownership of certain Copyright, patents, designs, trade marks and other intellectual property (the “Intellectual Property”) and any reproductions of copyright works in the thesis, for example graphs and tables (“Reproductions”), which may be described in this thesis, may not be owned by the author and may be owned by third parties. Such Intellectual Property and Reproductions cannot and must not be made available for use without the prior written permission of the owner(s) of the relevant Intellectual Property and/or Reproductions.

iv. Further information on the conditions under which disclosure, publication and commercialisation of this thesis, the Copyright and any Intellectual Property and/or Reproductions described in it may take place is available in the University IP Policy (see http://www.campus.manchester.ac.uk/medialibrary/policies/intellectualproperty.pdf), in any relevant Thesis restriction declarations deposited in the University Library, The University Library’s regulations (see http://www.manchester.ac.uk/library/aboutus/regulations) and in The University’s policy on presentation of Theses.
ACKNOWLEDGEMENTS

First of all thanks to God for keeping the world for me always so simple and wonderful. Thanks to Professor Keith Blackburn and Mr Ken Clark for giving me the opportunity to work under their supervision. Their enthusiasm about research, their professional skill and their knowledge impressed me deeply. I truly thank them for their kind support. Professor Keith Blackburn gave me continuous support to develop the ideas and the theory for the thesis. Mr Ken Clark gave me invaluable suggestions during selection of data and econometric techniques. By doing the thesis under their supervision, I learned a great deal not only about theoretical and empirical investigations, but also and more importantly about rethinking efficient external development finance. Thanks to all my colleagues in the department of Economics for their sincere appreciation about my work. Thanks to my parents and my husband Dr. Tareq to be always supportive.
ACRONYMS

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIC</td>
<td>High Income Countries</td>
</tr>
<tr>
<td>LMIC</td>
<td>Low and Middle Income Countries</td>
</tr>
<tr>
<td>MIC</td>
<td>Middle Income Countries</td>
</tr>
<tr>
<td>LIC</td>
<td>Low Income Countries</td>
</tr>
<tr>
<td>EAP</td>
<td>East Asia and Pacific</td>
</tr>
<tr>
<td>ECA</td>
<td>Europe and Central Asia</td>
</tr>
<tr>
<td>LAC</td>
<td>Latin American Countries</td>
</tr>
<tr>
<td>MNA</td>
<td>Middle East and North Africa</td>
</tr>
<tr>
<td>SA</td>
<td>South Asia</td>
</tr>
<tr>
<td>SSA</td>
<td>Sab Saharan Africa</td>
</tr>
<tr>
<td>LAMP</td>
<td>Latin American Migration Project</td>
</tr>
<tr>
<td>IV</td>
<td>Instrumental Variable</td>
</tr>
<tr>
<td>OLS</td>
<td>Ordinary Least Square</td>
</tr>
<tr>
<td>SEM</td>
<td>Simultaneous Equation Model</td>
</tr>
<tr>
<td>SUR</td>
<td>Seemingly Unrelated Regression Model</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>GDS</td>
<td>Gross Domestic Savings</td>
</tr>
<tr>
<td>ALR</td>
<td>Adult Literacy Rate</td>
</tr>
<tr>
<td>PGR</td>
<td>Population Growth Rate</td>
</tr>
</tbody>
</table>
Introduction

International migration occurs when people from countries with low wages, low productivity, and low resource availability, move and settle in countries with comparatively better opportunities. Remittances are the transfer of migrants’ savings abroad to their country of origin. In the remittance literature, migrants’ remitting motives include (i) exchange, (ii) insurance, (iii) investment along with more traditional motivation (iv) altruism. Altruism implies that the volume of remittances increases with the need of household members back home (Becker, 1974). Exchange motive corresponds to the repayment of the expenses borrowed by the family or friends while they travelled abroad (Cox, 1987). The insurance motive implies that the migrants send cash or kind to protect the family members’ standard of living during economic shocks (Lucas and Stark, 1991). The investment motive denotes that the migrants transfer funds in order to assist the family members to take on investment opportunities (Durand et al, 1996).

To compile statistics on remittances, one or more of three components of the balance of payments are frequently used: (i) workers’ remittances - current transfers by migrants form host to home countries, (ii) employee compensation - wages, salaries, and other benefits earned by non-resident individuals and paid by resident companies, and the remuneration received by residents from non-resident employers; for instance, earnings of seasonal workers and embassy employees, and (iii) migrants’ transfer - the flow of assets due to individuals’ change of residence from one country to another; for instance, transfer of accumulated assets while returning to home country. Workers’ remittances and compensation of employees are recorded in the current account under current transfer and income, respectively. In contrast, migrants’ transfers are recorded in the capital account of the balance of payments under capital transfers of nongovernment sectors (BPM5, the fifth edition of the Balance of Payments Manual). The flow of remittances is typically considered as periodic, unrequited, nonmarket transfers of money.
by a migrant back home. Migrants’ transfer is a one off transfer of funds. Therefore, we preferred to exclude migrants’ transfers, since inclusion of migrants’ transfers while calculating remittances could generate misspecification (Kumah and Razin 2009).

Although ever since early history people have moved and settled across borders, it has never reached the present immensity. The international flow of remittances would potentially increase over time with the growing out-migration experienced by many developing countries. According to official statistics (WDI 2011), in 2009, there were more than 215 million international migrants in the world (i.e., 3% of the world population). The worldwide remittance flows amounted to $416.5 billion, and the developing countries received $307 billion (i.e., 74%) of that. The remarkable increase in the flow of remittances to these developing countries has made it comparable to other capital flows. In 2009, the remittance flow was nearly three times the amount of official aid and almost as large as foreign direct investment (FDI). Moreover, flow of remittances to most of these countries seems to be stable with a fairly smooth upward trend and relatively minor annual fluctuations. Although there was a decline in the flow of remittances to developing countries following the most recent global financial crisis, the decline in nominal dollar terms was small compared to the fall in official aid or other private capital flows (Ratha and Mohapatra, 2010). In fact, the flow of remittances to developing countries was quite resilient. In 2009, although they dropped by 5.5%, they showed a quick recovery in the following year. In 2010, the total flow amounted to $325 billion following a 5.86% growth. The exact size, including unrecorded flows through formal and informal channels, is believed to be significantly higher. Formal transfers are offered by banks and money transfer operators while informal transfers include Hundi, Hawala or similar services. The amount of the informal flow of remittances typically ranges from 10 to 50% of the formal flow of remittances and for some counties it is even as high as 85% (Puri et al, 1999).

International migration leads to a more balanced distribution of capital, land and labour. It increases the global welfare when the labour deficient destination country takes advantage from cheap labour and the resource deficient sending country benefits from remittances (Massey et al 1993). Flow of remittances is likely to be counter-cyclical
relative to the recipient economy; they tend to rise when the recipient economy suffers a downturn in activity, an economic crisis, natural disaster, or political conflict, as migrants may send more funds during hard times to help their families and friends back home. For instance, in Central America the flow of remittances smoothed consumption following natural disasters, in Indonesia, the Philippines and Mexico remittances as a share of consumption expenditure increased following the financial crises, and in the Caribbean it worked as a stabilisation fund following the economic crises (Yang 2006, Ratha 2007). Moreover, remittances are unrequited transfers and can be used by the recipients to ease wealth constraints to invest in physical and human capital, smoothing consumption, and facilitating entrepreneurship (Roberts and Banaian 2004). Remittances are fungible, and so remittances that are not directly used for investment might have freed other resources to be used for investment. If remittances are used to buy other financial assets, i.e., land, vehicles, etc., they free resources to be invested in businesses (Rodriguez and Tiongson 2001). Earnings from remittances that are used for education can be considered as a productive investment in the long run. Increased expenditure in health, real estate or other assets raises supplementary economic activities (Adam 2006).

In order to use the remitted foreign currencies, the government has to purchase from the central bank (by using its deposits with central banks or commercial banks) or borrow from the central bank (by generating debt instruments). For many developing countries, remittances are a source of adequate foreign exchange to pay for trade deficits and foreign debt servicing obligations (Brown 1992). It gives the economy a cushion against external shocks and some measure of confidence (Joshi and Sanyal 2004). Hence, remittances can bring about real change in the economy. It is now, more than ever, crucial to study the impacts of remittance more profoundly. This research contributes to the discussion of international remittances by presenting novel insights on the basis of theoretical models and empirical analysis.

In the first chapter, we explore the effect of remittances on inequality and income distribution. Our model is in the spirit of contemporary models of income inequality based on capital market imperfections. The model shows how the prospect of remittances can reduce income inequality by enabling poor agents to get access to loan to undertake entrepreneurial activities who are otherwise denied opportunities due to credit rationing.
The basic framework describes an overlapping generations economy in which inequalities are explained by a combination of fixed costs of investment and capital market imperfections. We begin the analysis by first considering the standard scenario in which remittances are absent and the population is polarised into the rich and the poor. Subsequently, we introduced remittances in two different ways: remittances from migrants to parents, and remittances from migrants to siblings. In the first case, we showed that large flow of remittances helps the recipients to build up necessary savings to get access to the credit market. In the second case, we showed that flow of remittances not only helps the recipients to build up savings, but also reduces the critical level of wealth needed to get access to loans from financial intermediaries. More agents will eventually be able to move beyond subsistence and the initial inequality will reduce considerably in the long run. At the end of this chapter, we extended the model further to allow for endogenous migration. We found that compared to subsistence agents, the entrepreneurs are less constrained for sending children abroad.

In the second chapter, we empirically investigated to what extent the receipt of remittances affects household investment in entrepreneurial activity. One of the main strengths of this empirical work is that it combines the advantages of country-specific and cross-country analysis. Using household survey data from the Latin American Migration Project (LAMP, 1999-2003), we found that the impact of remittances on business investment varies across countries. In some Latin American countries, the flow of remittances increases the likelihood of entrepreneurship, but in other Latin American countries it does not. We tried to understand whether the results obtained from microeconomic (household) data is linked with the macroeconomic (country-specific) observations. Remittances promote entrepreneurship only in some Latin American countries that are enjoying a large and stable flow of remittances over the years. It is likely that the financial intermediaries would consider the overall macroeconomic trend of remittances before sanctioning credit to the recipient of remittances who actually built up necessary collateral using remittance earning.

In the third chapter, we investigated whether less dependence on foreign aid and more dependence on enhanced remittance earnings could accelerate capital accumulation and
growth of the recipient countries. To the best of my knowledge, there is no empirical work that incorporates the three most important flows of capital (i.e., aid, FDI and remittance) in growth regressions and offset the endogeneity problem to determine their true impact on growth. We found empirical evidence that remittances are more efficient than foreign aid in augmenting growth. We argue that remittances have favourable impact on growth as it is more effective than foreign aid in enhancing capital accumulation. At the end of this chapter, our theoretical model shows that foreign aid increases the amount of investment capital of the economy. In case of remittances, the rate of capital accumulation is even higher since remittances flow directly to recipients whilst aid is channelled through public institutions that suffer from corruption. Existence of corruption cannot undermine the capital enhancing potential of remittances.
Chapter 1

**DYNAMIC EFFECTS OF MIGRANTS’ REMITTANCES ON INEQUALITY AND INCOME DISTRIBUTION**

1.1 Introduction

There is a broad consensus that international remittances facilitate capital formation and enhance economic development. There exists imperfection in the capital market arising from the problem of moral hazard and/or adverse selection.\(^1\) Due to credit rationing, access to credit market is by and large restricted to relatively rich households. Such inefficiency in the capital market may well be reduced if potential borrowers could offer lenders marketable resources as collateral against loan. International remittances can play an important role in this regard. It can help the poor to build up necessary savings and credit histories such that they get access to credit from financial intermediaries against the predictable income from remittances to start productive activities. However, if the credit market is extremely inefficient, remittance can become a significant complement by helping the poor bypass high lending costs. In the presence of more advanced financial system, remittances may be treated like any other form of savings to be allocated to high yield projects. Therefore, remittances have a huge potential in reducing poverty and inequality through facilitating entrepreneurship. The present analysis investigates the likelihood that remittances reduce initial inequalities by creating investment opportunities for the poor to move beyond subsistence living. It is a contribution to the theoretical literature of remittances, offering a further perspective that has not, to our best knowledge, been considered before.

\(^1\) Moral hazard occurs due to lack of enforceability of loan contracts and adverse selection occurs due to high cost of gathering information of borrower’s type and ability.
1.2 Remittances, Inequality, and Income Distribution

There are in fact not many papers that investigate the remittance issues. The microeconomic literature since the early 1980s focused mainly on the determinants of remittances, with insurance and investment motives being increasingly acknowledged, along with more traditional altruistic and familial motivations. At the macro level, research during the 1970s and 1980s concentrated mainly on the short-run impact of remittances through their effects on prices and exchange rates within the framework of static trade models. Later on the research on remittances gradually shifted to long-run considerations, particularly the role of remittances in the dynamics of inequality and development.

From the short-run perspective, traditional Keynesian macroeconomic models, based on the assumption of sticky prices and fixed exchange rates, explained the multiplier effect of a demand-side shock, e.g., a shock induced by remittances, on aggregate expenditure. The Mundel-Flemming model is the classic example, explaining how the macroeconomic effects of such a demand shock on national income depends on the extent of capital mobility and the exchange-rate regime. Under perfect capital mobility and flexible exchange rates, the equilibrium level of GDP is unaffected by international transfers as the rise in national expenditure induced by remittance inflow is fully compensated by a currency appreciation. But in a fixed exchange-rate regime, the equilibrium of the balance of payments is achieved through variations in the money supply and therefore, remittance inflow may well stimulate national income. Adelman and Taylor (1992), build up a social accounting matrix to examine the scale of direct and indirect effects of remittances on national income of late 1980s Mexico and found that each dollar of remittance boosted Mexico’s output by three dollars. However, El-Sakka and McNabb (1999), using data for Egypt over 25 years (1967-1991), found a smaller multiplier effect of remittances on national income.

The trade-theoretic literature on international transfers, with its assumptions of flexible price and full employment, explains how a positive transfer may deteriorate the terms of trade of the receiving country when transfers are mostly used to pay for an excess
demand of traded goods. However, the conditions required for this negative terms of trade effect to outweigh the positive income effect, are very restrictive and therefore the idea that international transfers benefit the receiving countries is fairly well accepted. But, when international transfers are mostly used to pay for an excess demand of non-traded goods by the remittance receiver, they would raise the relative price of these goods. If the remittance non-receivers are the net suppliers of these non-traded goods, the positive price effect experienced by remittance non-receivers will dominate the positive income effect and negative price effect experienced by remittance-receivers, and thus a reasonably higher amount of remittances will on the whole be Pareto improving. Djajic (1986) described that the net effect of migration on the welfare of remaining residents depends on the volume of remittances. The non-receivers could be benefitted from such international transfer if the flow of remittances is large enough to increase the demand of non-traded goods by the remittance receivers and stimulates the purchasing power of the remittance non-receivers when they are the net suppliers of non-traded goods. In contrast, a smaller transfer would reduce the price of non-traded goods and also the welfare of the remittance non-receiver. Quibria (1997), in a simple two-class, two-factor (capital and labour), two-commodity (traded and non-traded), general equilibrium model, showed that emigration does not affect all types of residents symmetrically; there are both advantaged and disadvantaged residents and the distribution depends on the quantity of remittances, factor endowments and the type of emigration. But if accompanied by adequate remittances, pure emigration is always welfare improving to the non-emigrants in the source country. McCormick and Wahba (2000) proposed a model of joint determination of migration and remittances and explained that for certain values of the parameters there will be multiple equilibria corresponding to different level of migration flows and resulting remittances. The high-migration equilibrium pareto dominates the low-migration equilibrium implying both remittance receiver and non-receiver would be benefitted from higher migration rates if there exists lump sum transfers between residents. The modern short-run macroeconomic approach to studying remittances takes into account the endogenous determination of wages and prices, where expectations play a critical role. If expenditure shocks (e.g., induced by international remittances) are perfectly anticipated by wage-setters, and prices are fully flexible, there should be no effect on output. But under sluggish price or wage adjustments, temporary real effects
could be attained. So far there is no study on the short-run effects of remittances applying the most recent econometric techniques to these modern short-run macroeconomic approaches, mainly due to a lack of appropriate data.

From a long-run perspective, during 1970s the issue was to examine the effect of migration on investment and growth. Rempel and Lodbell (1978) found remittances to be heavily used for financing consumption by the remittance receiver and therefore have limited effect on the total national investment. In contrast, Stark (1978) explained that additional income from remittances will increase the volume of investment even if the actual cash remitted is not invested. In the 1980s the debate on the investment and growth effects of remittances shifted from productivity to inequality. Taylor and Wyatt (1996) found that remittances reduces economic inequality in the origin communities and contribute to alleviate liquidity constraint, promote investments in new agricultural techniques, education and further migration. In recent long-run macroeconomic literature, network effects have been considered to illustrate how the impact of remittances on inequality is likely to vary over time displaying an inverse U-shaped pattern. Initially, remittances may intensify inter-household inequality as members from only relatively rich households are able to migrate. This is due to higher migration costs which include transportation and border crossing expenditures, information cost, search cost for a job at destination. But such costs are likely to shrink with the increase in the size of the relevant network of migrants at destination and consequently the low-income households will eventually be able to afford migration and income inequality will diminish in the long run. Stark, Taylor and Yitzhaki (1986), using household data of 2 Mexican villages, found that the impact of remittances on rural income inequality depends critically on the village’s migration history which in fact captures the migration cost. If there is a large internal migration but little international migration, then international remittances have an unfavourable impact but internal remittances have a favourable impact on rural income distribution. However, if there is a long history of sending people abroad, international remittances do have an equalizing impact on rural income distribution. McKenzie and Rapoport (2004), using two detailed survey data sets on Mexican migration, found that migration networks increases the likelihood of migration by decreasing the costs of migration and exert a favorable impact on the extent
of inequality. In areas of high migration, asset inequality declines more than consumption or income inequality. For the communities with a more diverse migration experience, migration appears to increase inequality at lower levels of migration stock and subsequently reduce inequality as the migration stock becomes high.

Most recent theoretical studies illustrate how migration and remittances facilitates capital formation and enhances economic development. Rapaport and Docquier (2006) illustrated how migration and remittances determine the long-run income distribution of the economy in the presence of capital market imperfections. They explained how remittances help an economy starting from an initial underdevelopment trap to move towards an efficient long-run equilibrium. They extended the model of occupational choice by considering both existing domestic occupations and migration to a high wage destination. They explained that the economy is in a low wage inefficient state if the proportion of agents without access to entrepreneurship is very high due to relatively large initial inequality. Migration prospects allow an economy stuck in an underdevelopment trap to shift towards the efficient long run equilibrium. They found that intergenerational transfers have no dynamic effects if the steady-state wealth of a migrant’s offspring remains below the critical level needed to become entrepreneur. But the economy converges to the efficient equilibrium if migrants’ descendants gain access to entrepreneurship and domestic workers’ descendants gain access to migration and eventually, to entrepreneurship. However, one of the main limitations of their model is that it is lacking proper micro foundation of the wealth generating process. In particular, the critical amount of wealth needed to gain access to the credit markets is treated as exogenously given. In a more recent paper Shen, Doquire and Rappaport (2010) proposed a dynamic theoretical framework to show that the short and long run effect of remittances on inequality could be of opposite signs and therefore, the relationship exhibits an inverse U-shape. The same result was obtained by Stark, Taylor and Yitzhaki (1986) and McKenzie and Rapoport (2004). Unlike these papers Shen, Doquire and Rappaport (2010) need not endogenise migration cost in order for the disadvantaged household to overcome liquidity constraint. Rather, they do so simply via intergenerational wealth transfer. One of the limitations of their paper is that they did not endogenise migration decision.
1.3 Aims and Contributions of this Study

Our analysis is a contribution to the theoretical literature of remittances. With proper micro foundation, we investigated the effects of overseas remittances in the evolution of income inequality and wealth distribution. The analysis is based on an overlapping generations model in which inequalities are explained by a combination of capital market imperfections and fixed costs of investment. Together, these features give rise to credit rationing such that some members of the population are denied opportunities that would otherwise make them better off. Within this framework, we study the implications of remittances associated with child migration. We begin the analysis by first considering an economy without remittances where access to entrepreneurship is restricted to relatively rich households and the poor people lacking collateral are forced into subsistence occupation. Subsequently, we introduce remittances in two different ways according to who receive remittances – parents or siblings. In the first case, migrant children send remittances to their parents; such transfer would result in higher bequests though not necessarily initiate a reduction in the extent of inequality except for when remittance flow is sufficiently high. In the second case, migrant children send remittances to their siblings; such transfer would result in greater bequests. More importantly, it reduces the critical level of wealth needed to get access to capital market, implying that remittance flow generates investment opportunity to even poor members of the population and have the potential to reduce poverty and inequality significantly. The final extension to the model consists of the endogenisation of migration. We found different critical levels of wealth for subsistent occupant and entrepreneur in order for migration to occur. We also found that when the flow is not large, remittances not necessarily boost entrepreneurship; in the economy there are in fact some remittance receivers who are engaged in low yielding subsistence activities. However, large flow of remittances is always supportive of entrepreneurial activity.

The rest of the paper is organised as follows: Section 1.4 reviews contemporary models of income inequality based on capital market imperfections. Section 1.5 presents the basic framework when there are no remittances. Section 1.6 extends the model to incorporate remittance flows from children to parents. Section 1.7 does likewise to
consider remittance flows from children to siblings. Section 1.8 makes a final extension to allow for endogenous migration. Finally, section 1.9 contains some concluding remarks.

### 1.4 Models of Income Inequality Based on Capital Market Imperfection

Contemporary theories of income distribution consider financial market imperfections in explaining why the limiting income distribution may depend on initial conditions. The basic analytical framework considers an overlapping generations economy in which altruistic agents derive utility from their own consumption and the bequests they make to their children. Each agent faces a choice between investing in a low cost, but low yielding, subsistence activity or a high cost, but high yielding, investment project which may require external funding from financial intermediaries in the case of insufficient wealth. Inefficiency in the capital market implies that the incidence of borrowing allowed would depend on the size of an agent’s bequest. Borrowing is allowed to only those individuals whose inheritance is greater than some critical level. These individuals are able to take on entrepreneurial activity and bequeath comparatively more to their children who, in turn, are more able to engage in better investments. Conversely, individuals whose inheritance is below the critical level are denied such opportunities and are forced into subsistence living. Under such circumstances, initial inequalities persist and the population is polarized into the rich and the poor.

Galor and Zeira (1993) considered an open economy with two period lived altruistic agents. In the first period, agents invest in human capital or work as unskilled labour. In the second period, they work as skilled or unskilled, and derive utility from their own consumption and the bequests they make to their offspring. The economic dynamics of dynasties depend on the initial distribution of wealth. All generations of rich dynasties invest in human capital, work as skilled labour and leave large bequests. In contrast, individuals who belong to poor dynasties inherit less, work as unskilled, and leave small bequest. In the short run, due to capital market imperfections, the initial distribution affects aggregate amount of investment in human capital and of output. In the long-run, the inherited distribution of wealth also affects the aggregate output and investment.
Technological non-convexity (i.e., indivisibilities in investment in human capital) results in multiple steady states which gives an explanation of why there exists differences between economies.

Banerjee and Newman (1993) explained how the pattern of occupational choice is determined by the initial distribution of wealth and how the dynamics of occupational choice influence the process of development. Inefficiency in the capital market arises from the moral hazard problem of risk-averse agents. Agents either invest in a safe but low yielding project or a risky but high yielding project. In case of the latter, the agent would like to issue equity on the capital market in order to diversify the risks. But the more the issuance of equity, the less will be their share of the project return and the less effort they will supply. The agent’s ability to diversify risk depends on his initial or inherited wealth. Rich agents hold a larger fraction of share of their own project in order to satisfy the incentive constraints on unobservable effort. This raises their exposure to the risk and may deter them from investing altogether. Eventually, initial inequalities between the poor and the rich will become smaller.

Aghion and Bolton (1997) analysed the process through which wealth accumulated by the rich would trickle down to the poor and reduce income inequality. Capital market imperfection occurs due to the moral hazard problem. Risk neutral agents prefer to self-finance and borrow only if their inherited wealth does not cover the start-up cost of the project. The amount of effort the agent supplies is inversely related to the amount borrowed since the more they borrow the greater the proportion of project returns they have to share with other investors. This gives rise to three classes of people: (i) an upper class – who finance their own project and also other projects (ii) a middle class – who borrow from financial intermediaries to invest to their own project (iii) and a lower class – who are denied loans and can only invest partially in the projects of others. In this situation a high rate of capital accumulation would facilitate the convergence of the economy towards a unique steady-state wealth distribution. The wealthy class would bequeath more to their offspring and more capital accumulation in the economy implies more funds are available for investment. If capital accumulation takes place fairly quickly, the rate of interest might fall sufficiently to enable the credit rationed poor
individuals to acquire loans for their own project investment. Although the process of capital accumulation initially widens the gap between rich and poor, later on it reduces the gap. The model generates a Kuznets curve. Such a trickle-down effect enables all individuals to invest in their own projects and a long run efficient wealth distribution is attained that is independent of the initial distribution.

Blackburn and Bose (2003) presented an analysis of income distribution based on an overlapping generations model of imperfect capital markets, technological non-convexities and information acquisition. Credit rationing occurs for those individuals whose inherited wealth falls below some critical level. The critical level of wealth depends on agents’ perceived riskiness of the economic environment measured by the forecast error variance of future technology shocks. Such forecasts are revised over time as agents learn more about the environment using past experiences with risky enterprises. This informational externality results in endogenous variations in the critical level of wealth. If, at any point in time, a relatively large number of agents undertake the risky investment, the greater informational externality could reduce the critical level of wealth such that all agents eventually get access to the capital market and become project investors in the long run. It is this knowledge-spillover associated with learning behavior, that might eliminate initial inequalities. The extent to which this trickle down from the rich to the poor takes place depends fundamentally on initial conditions. If the initial size of the upper class lies below a minimum value, there will be no trickle-down and the population will remain polarized in its original class division. If the initial size of the upper class and the middle class exceed critical values, there will be complete trickle-down and society will be classless. Between these two extremes, partial trickle down would result in multiple steady state equilibria related with different sized groups of rich and poor.

1.5 The Benchmark Model

Our model shares many of the features of the frameworks described above. We consider a small open economy which is populated by two-period lived agents belonging to overlapping generations of dynastic families. Each agent has one parent and (1 + n)
children; Each agent has one parent and \((1 + n)\) children; \(n > 0\) and takes up an integer value to avoid convergence of population to a constant number. The initial income distribution is given which accounts for initial inequalities in the economy. In the first period of life an agent inherits wealth from her parent and faces a choice between two courses of action: on the one hand, she can simply invest this wealth at the exogenous world interest rate, \(i\), whilst working in some routine activity (a subsistence occupation) to produce \(s\) units of current income which she saves; on the other hand, she can use her inherited wealth to take on a more productive project (an entrepreneurial occupation) which requires \(k\) units of initial capital outlay and which yields \(A > s\) units of future income. In the second period of life the agent consumes and makes bequests to her own offspring.

We assume that agents have identical preferences defined over consumption and bequests. The lifetime utility of an agent born at time \(t\) is given by

\[
u_t = \gamma \log(c_{t+1}) + \beta \log(b_{t+1})
\]

(1.1)

where \(c_{t+1}\) denotes consumption and \(b_{t+1}\) denotes the bequest given to each child. If \(x_{t+1}\) is the total realised income available to the agent over her lifetime, the budget constraint she faces is

\[
c_{t+1} + (1 + n)b_{t+1} = x_{t+1}
\]

(1.2)

Maximising (1.1) subject to (1.2) delivers the optimal allocations for consumption and bequests as follows:

\[
c_{t+1} = \frac{\nu}{\gamma + \beta} x_{t+1}
\]

(1.3)

\[
b_{t+1} = \frac{\beta}{(\gamma + \beta)(1+n)} x_{t+1}
\]

(1.4)

Substituting (1.3) and (1.4) into (1.1) gives utility as

\[
u_t = U + (\gamma + \beta) \log(x_{t+1})
\]

(1.5)

where \(U = \gamma \log \left( \frac{\nu}{\gamma + \beta} \right) + \beta \log \left( \frac{\beta}{(\gamma + \beta)(1+n)} \right)\).
Evidently, the agent would like to choose the occupation (subsistence or entrepreneurship) that gives the highest total realised income, $x_{t+1}$. The value of $x_{t+1}$ associated with each occupation is given by

$$x_{t+1} = \begin{cases} 
(1 + i)(b_t + s) & \text{if subsistence,} \\
(1 + i)(b_t - k) + A & \text{if entrepreneurship.}
\end{cases}$$

If the agent’s inherited wealth is less than the start-up cost required for becoming an entrepreneur, the agent has to depend on the credit market to become an entrepreneur. An agent is able to self-finance project investment if $b_t \geq k$ (in which case $(1 + i)k$ is the opportunity cost of this investment), but must acquire a loan if $b_t < k$ (in which case $(1 + i)k$ is the loan repayment). Loans are provided by financial intermediaries. These financial intermediaries have access to a perfectly elastic supply of funds at the world interest rate, $i$. We assume that $A - (1 + i)k > (1 + i)s$ which has two implications: first, an agent never goes bankrupt as she is always able to repay her loan out of the income from the project; second, an agent always prefers to undertake this project rather than produce at subsistence as she is always better off by doing so.

### 1.5.1 Eligibility for Loans

In this study we consider that financial market imperfection arises due to imperfect enforcement of loan contracts between borrowers and lenders. The inefficiency in the financial market would ideally be eliminated if (i) the lenders have the capability to perfectly enforce loan contracts (ii) the potential borrowers are able offer the lender marketable asset as collateral against loan. But in poor communities, the enforcement of loan contact is difficult and the ownership of wealth is small or non-existent and therefore, some agents are unable to secure loans.

We make the common assumption that any agent who applies for a loan must put up all of her inherited wealth as collateral against the loan. We also allow for the possibility that an agent who borrows can deliberately default on her debt obligations - that is a borrower may abscond with the output from her project without ever repaying her loan. Suppose that, if an agent was to do this, then any income accruing to her is inaccessible
to lenders who either fail to track her down, or fail to apprehend her before she has the chance of disposing of her income. However, that the agent loses all of her collateral \((1 + i)b_t\). The total cost, \(f\), associated with her actions includes the loss of her collateral and effort or resources she must spend to avoid arrest. The net income to a defaulter is therefore \(x_{t+1} = A - f\). Evidently, this must be no greater than the income from not defaulting (given in (1.6)) if defaulting is not to occur: that is \(A - f \leq (1 + i)(b_t - k) + A\). From this incentive compatibility constraint we may determine a critical value of wealth, above which loans are granted and below which loans are refused. This is the value \(\hat{b}\) which satisfies

\[
\hat{b} = k - \frac{f}{1 + i}
\]

(1.7)

Loans are given only to agents whose inherited wealth is greater than \(\hat{b}\), and not to agents whose inherited wealth is less than \(\hat{b}\). Clearly, since loans are given only to agents who would never default and not to agents who would always default, defaulting is prevented and only a subset of the population is eligible for loans.

### 1.5.2 Dynamics of Income Distribution

Given the above, we are able to determine the rules governing changes in the fortunes of each dynastic family. These lineage dynamics describe the transition of individual wealth from one generation to the next according to the choice of occupation that is made each period by the agents. From these dynamics, the long-run distribution of income, starting from any given initial distribution, can be inferred.

We know that each agent of generation \(t\) makes bequests to her offspring in accordance with (1.4) and their final income, \(x_{t+1}\), according to their choice of occupation, is given in (1.6). We also know that agents who engage in subsistence production (project investment) are those members of the population for whom \(b_t < \hat{b}\) \((b_t \geq \hat{b})\). Therefore, the intergenerational evolution of wealth for an individual dynasty can be described as follows
These transition equations are portrayed in Fig-1.1 as (i) and (ii), respectively. It is assumed that \( \frac{\beta(1+i)}{(1+n)(\gamma+\beta)} < 1 \) so that the transition process is stable in each case. If \( B = \frac{\beta(1+i)}{(1+n)(\gamma+\beta)} \), then the terms \( b^* = \frac{B s}{1-B} \) and \( b^{**} = \frac{B [1 - k]}{1-B} \) are the limiting outcomes of these processes, the former (latter) being the steady state level of wealth for a representative dynasty whose members across all generations produce at subsistence (undertake project investment). The fact that \( b^* < b^{**} \) follows from our earlier assumption that \( (1 + i) s < A - (1 + i)k \).

Under further parameter restrictions, we also have \( b^* < \bar{b} \) and \( b^{**} > \bar{b} \): the first feature serves to simplify and sharpen the analysis by ensuring that any lineage which succeeds in acquiring a loan will never return to subsistence (i.e., once an investor, always an investor); given this, the second feature then makes our analysis non-trivial by precluding the situation in which all lineages (including even those that are denied loans to begin with) automatically end up as entrepreneurs. The long-run distribution of income is straightforward to characterize for this economy. The only agents who become entrepreneurs are those who are relatively well-off to begin with, having a level of wealth that exceeds the critical value. All other agents with wealth below this value remain forever in subsistence. Thus initial inequalities persist as the agents end up belonging to one of two classes—rich or poor.

This contemplates our description of the benchmark model. In what follows we extend the model to take account of remittance behaviour by considering the case in which some members of a family are sent abroad when they are young to earn a relatively high income, part of which is sent back home. One question that arises is whether there is any difference between remittances that flow to adults (i.e., parents) and remittances that flow to children (i.e., siblings) in their effects on income distribution. We consider each in turn. In both cases, we assume that each parent of each generation sends a fraction, \( \theta \), of her children abroad, with the remaining fraction, \( (1 - \theta) \), staying at home. If all
children are sent abroad, the domestic economy will cease to exist. We also assume that those sent abroad never return home (i.e., there is no reverse migration). A migrant child earns an overseas income, $w$ and agrees with her parents to remit a fraction, $\alpha$, of her earning back home, implying a value of remittances, $r_t = \alpha w$. The overseas income, $w$, is exogenous; the home country is small enough to keep wages at destination unaffected by migration. A parent who sends a child abroad incurs a migration cost of $r_{tp} < r_{hp}$, where $r_{tp} < r_{hp} < r_{h}$. For now, we treat the fraction of agents, $\theta$, as exogenous. Subsequently, we extend the model further to allow for endogenous migration.

### 1.6 An Economy with Remittances from Children to Parents

We will first consider the case when the recipients of remittances are parents. The agent’s lifetime utility is the same as in equation (1.1). However, the budget constraint is different due to the existence of migrant children. We assume that a parent bequeaths wealth only to her children who stay at home and not to her children who are sent abroad to earn higher income.$^2$ Given this, the total value of bequests is $\theta((1+n)b_{t+1}$. Correspondingly, the agent’s budget constraint is

\[
   c_{t+1} + (1 - \theta)(1 + n)b_{t+1} = x_{t+1}
\]  

(1.9)

The allocation of consumption and bequest that maximise (1.1) subject to (1.9) are

\[
   c_{t+1} = \frac{y}{y+\beta} x_{t+1}
\]  

(1.10)

\[
   b_{t+1} = \frac{\beta}{(y+\beta)(1-\theta)(1+n)} x_{t+1}
\]  

(1.11)

Utility is then computed by substituting equation (1.10) and (1.11) into (1.1) as

\[
   u_t = V + (y + \beta) \log x_{t+1}
\]  

(1.12)

where $V = y \log \left( \frac{y}{y+\beta} \right) + \beta \log \left[ \frac{\beta}{(y+\beta)(1-\theta)(1+n)} \right]$.

Due to the presence of remittances and migration cost, the final income of the agent will also be different. The agent sends $\theta(1+n)$ of her children abroad and each child remits an amount of $r_{t+1} = \alpha w$. The total value of remittances that the agent receives when old

---

$^2$ This is not a crucial assumption and one could allow parents to leave bequests to all of their offspring without altering the main results.
is, therefore, $\theta(1+n)\alpha w$. The agent incurs migration cost of $\mu$ for sending each child abroad implying a total migration cost, $\theta(1+n)\mu$, when old. The agent’s income is therefore

$$x_{t+1} = \begin{cases} 
(1+i)(b_t + s) + \theta(1+n)\alpha w - \theta(1+n)\mu & \text{if subsistence,} \\
(1+i)(b_t - k) + A + \theta(1+n)\alpha w - \theta(1+n)\mu & \text{if entrepreneurship.}
\end{cases} \tag{1.13}$$

Under the same parameter restriction as before $-A - (1+i)k > (1+i)s$ - there is never any bankruptcy and never any preference for subsistence.

### 1.6.1 Eligibility for Loans

As before, we account for the possibility that agents might default on their loans. Given our previous description of events, the payoff from defaulting is $A - f + \theta(1+n)\alpha w\tau - \theta(1+n)\mu$. In addition to the output from the project, the agent is able to keep her remittances as these are received when the agent is old and do not therefore serve as collateral which can be seized. Like her income from the project, the agent can consume these remittances in hiding. Comparing this payoff with the income from not defaulting (given in (1.13)), the condition for no defaulting to occur is $A - f + \theta(1+n)\alpha w\tau - \theta(1+n)\mu \leq (1+i)(b_t - k) + A + \theta(1+n)\alpha w - \theta(1+n)\mu$. This incentive condition implies the same critical value of wealth, $\hat{b}$, as that given in (1.7). If an agent’s bequest, $b_t$, is greater than or equal to this critical level of wealth, $\hat{b}$, she is eligible for loan, should she require one, to instigate entrepreneurship; but if her $b_t$ lies below this $\hat{b}$, she is deprived of loans and excluded from productive investment.

### 1.6.2 Dynamics of Income Distribution

The above results can be used to deduce the dynamics of income distribution. Agents in this economy bequeath wealth to their offspring according to (1.11). The value of $x_{t+1}$ is given by (1.13) and subsistence production (project investment) is undertaken by agents for whom $b_t < \hat{b}$ ($b_t \geq \hat{b}$). It follows that the transition of lineage wealth satisfies
These dynamic equations are portrayed in Fig-1.2 as to describe the intergenerational transition of wealth when remittances flow from children to parents. When remittances flow from children to parents, each of these transition paths is higher compared to the previous case when there is no remittance. In case of agents whose inherited wealth \( b_t < \tilde{b} \), the transition path shifts from (i) to (iii) or (iv), where the latter occurs due to a higher remittance transfer. In case of agents whose inherited wealth \( b_t \geq \tilde{b} \), the transition path shifts from (ii) to (v) or (vi). Such higher transition paths imply an improvement in the fortunes of all agents; though not necessarily initiate a reduction in the level of inequality. When the transition path shifts from (i) to (iii), there is no effects on the total number of entrepreneurs since the steady-state wealth of agent’s offspring remains below the critical level of wealth needed to get access to capital market. But in case of large remittance flow, the transition path shifts from (i) to (iv), the agent becomes qualified to get loan from financial intermediaries to start up business activity and the transition path jumps to (ii).

**Proposition 1**: If the transfers of remittances from children to parents are sufficiently high such that \( b^* > \tilde{b} \), then inequality would reduce in the long-run.

### 1.7 Remittances from Children to Siblings

Let us now consider the case in which migrant children send remittances to their siblings. We are interested in the characterisation of inter-household inequality and not in the intra-household distribution of income. We assume that each migrant remits an equal amount of fund to each sibling at home. As before the utility function and budget constraint of a representative agent is given by (1.1) and (1.9), respectively. Thus (1.10), (1.11), and (1.12) continue to apply. However, the expression for final income is different. Since \( \theta(1 + n) \) of her siblings are sent abroad, and since each sibling remits an amount of \( r_t = \alpha \nu \) to her, the total value of remittances that an agent receives from her siblings when young is \( \theta(1 + n)\alpha \nu \) which is saved. The total migration cost that the
agent incurs for sending her children abroad when old is $\theta(1+n)\mu$. The income of the agent is therefore given by

$$x_{t+1} = \begin{cases} 
(1+i) \{ b_t + s + \theta(1+n)aw \} - \theta(1+n)\mu & \text{if subsistence,} \\
(1+i) \{ b_t - k + \theta(1+n)aw \} + A - \theta(1+n)\mu & \text{if entrepreneurship.} 
\end{cases} \quad (1.15)$$

where $A - (1+i)k > (1+i)s$, as usual.

### 1.7.1 Eligibility for Loans

Another feature that changes from before is the incentive to default on loans. Since the agents receive remittances from siblings when young, remittances serve as additional collateral which can be seized in the event of defaulting. The payoff from defaulting is therefore $A - f - \theta(1+n)\mu$ which, compared to the income from not defaulting (given in (1.15)), yields the following condition for defaulting not to occur: $A - f - \theta(1+n)\mu \leq (1+i) \{ b_t - k + \theta(1+n)aw \} + A - \theta(1+n)\mu$. This new incentive condition instigate a different critical level of wealth, $\tilde{b}$, as follows

$$\tilde{b} = k - \frac{f}{1+i} - \theta(1+n)aw \quad (1.16)$$

**Proposition 2**: If the transfers of remittances from children to siblings results in evolution of wealth such that $b^* > \tilde{b}$, then inequality would reduce in the long-run.

A level of wealth at least equal to $\tilde{b}$ allows an agent to acquire a loan and invest in a project; otherwise she has to carry on subsistence occupation. Comparing (1.16) with (1.7), we see that $\tilde{b} < \bar{b}$. One of the main innovations of our analysis lies in the fact that the critical value of wealth needed to get access to credit market is endogenous; it depends on who receives remittances – parents or siblings.

**Proposition 3**: $\tilde{b} < \bar{b}$ implies that the critical level of wealth required to get access to the capital market is lower in the case of remittances from children to siblings than the case of remittances from children to parents.
Since siblings receive remittances when young, remittances serve as additional collateral for them. Hence, compared to the previous case the agent requires a lower level of inherited wealth to get access to the credit market. A reduction in the critical level of wealth from $\bar{b}$ to $\bar{b}$ implies that more agents will be able to undertake project investment. Such lower critical level of wealth raises the possibility of considerable increase in entrepreneurial activity and reduction in inequality.

1.7.2 Dynamics of Income Distribution

Agents bequeath wealth to their offspring according to (1.11). The value of $x_{t+1}$ is given by (1.15) and subsistence production (project investment) is undertaken by agents for whom $b_t \leq \bar{b}$ ($b_t \geq \bar{b}$). It follows that the transition of lineage wealth satisfies

$$b_{t+1} = \begin{cases} 
\frac{\beta}{(1+n)(1-\theta)(\gamma+\beta)} [(1+i)(b_t + s + \theta(1+n)a) - \theta(1+n)\mu] & \text{if } b_t < \bar{b} \\
\frac{\beta}{(1+n)(1-\theta)(\gamma+\beta)} [(1+i)(b_t - k + \theta(1+n)a) + A - \theta(1+n)\mu] & \text{if } b_t \geq \bar{b} 
\end{cases} \quad (1.17)$$

These dynamic equations portrayed in Fig-1.3 describe the intergenerational transition of wealth when remittances flow from children to siblings. The effect of remittances is to shift up the transition paths from (i) to (vii) and from (ii) to (viii), so that all agents are made better off. These shifts could be greater than the previous case when remittances are sent to parents.

**Proposition 4:** If $(1 + i) > (1 - \theta)(1 + n)$, then the shift in the transition path is greater when remittances are sent to siblings than when they are sent to parents.

In sum, the flow of remittances from children to siblings not only shifts the transition paths up but also relaxes the borrowing constraint such that even poorer agents are now able to undertake project investment.³

³ The effects of remittances flowing from children to parents compared to children to siblings would be qualitatively the same as long as children sent funds to parents when the latter are still young. When parents get funds at their young age, they can use it as collateral against loan like siblings. Therefore, for these parents the critical level of wealth needed to get access to capital market will be lower like siblings.
1.8 Endogenising Migration

The final extension to the model involves the endogenisation of migration. In order to study this in a relatively straightforward way, we assume that \( n = 1 \) (i.e., each agent has two children) and \( \theta = 1/2 \) or \( \theta = 0 \) (i.e., one child at most is sent abroad and one child stays at home). Both children cannot be sent abroad; otherwise the domestic economy will cease to exist. Everything else in the model remains unchanged. These changes simplify the analysis without altering any of the results.

The life time utility of an agent is given as before by equation (1.1) and the budget constraint is given by

\[
ct + 2bt = xt
\]

Maximising (1.1) subject to (1.18) yields

\[
ct = \frac{\nu}{\gamma + \beta} xt \quad \text{ (1.19)}
\]

\[
2bt = \frac{\beta}{\gamma + \beta} xt \quad \text{ (1.20)}
\]

Substituting (1.19) and (1.20) into (1.1) gives utility as

\[
u_t = U + (\gamma + \beta) \log xt + \beta \log \left( \frac{\beta}{\gamma + \beta} \right) - \beta \log(2)
\]

where \( U = \gamma \log \left( \frac{\nu}{\gamma + \beta} \right) + \beta \log \left( \frac{\beta}{\gamma + \beta} \right) - \beta \log(2) \)

The value of \( xt \) associated with each occupation is given by equation (1.6). The critical level of wealth is given by equation (1.7), below (above) which loans are denied (granted). The dynamics of lineage wealth are described by

\[
b_{t+1} = \begin{cases} 
\frac{\beta}{2(\gamma + \beta)} [(1 + \iota)(b_t + s)] & \text{if } b_t < \bar{b} \\
\frac{\beta}{2(\gamma + \beta)} [(1 + \iota)(b_t - k) + A] & \text{if } b_t \geq \bar{b}
\end{cases}
\]

where \( B = \frac{\beta(1 + \iota)}{2(\gamma + \beta)} < 1 \) , for stability in each case.

In the economy with remittances from children to parents, the life time utility of an agent is given by equation (1.1). The budget constraint will be
\[ c_{t+1} + b_{t+1} = x_{t+1} \] 

Maximising (1.1) subject to (1.23) yields

\[ c_{t+1} = \frac{\gamma}{\gamma + \beta} x_{t+1} \]  

(1.24) 

\[ b_{t+1} = \frac{\beta}{\gamma + \beta} x_{t+1} \]  

(1.25) 

Utility is then computed by substituting (1.24) and (1.25) into (1.1)

\[ u_t = V + (\gamma + \beta) \log(x_{t+1}) \]  

(1.26) 

where \( V = \gamma \log\left(\frac{\gamma}{\gamma + \beta}\right) + \beta \log\left(\frac{\beta}{\gamma + \beta}\right) \)

The agent’s final income will be

\[ x_{t+1} = \begin{cases} 
(1 + i) (b_t + s) + aw - \mu & \text{if subsistence,} \\
(1 + i) (b_t - k) + A + aw - \mu & \text{if entrepreneurship}
\end{cases} \]  

(1.27) 

where \( A - (1 + i) k > (1 + i) s \), as before. The critical level of wealth is given by equation (1.7). The dynamics of lineage wealth are described by

\[ b_{t+1} = \begin{cases} 
\frac{\beta}{\gamma + \beta} [(1 + i)(b_t + s) + aw - \mu] & \text{if } b_t < \bar{b} \\
\frac{\beta}{\gamma + \beta} [(1 + i)(b_t - k) + A + aw - \mu] & \text{if } b_t \geq \bar{b}
\end{cases} \]  

(1.28) 

As in the original analysis, these transition paths are higher and steeper than in the case without remittances, giving rise to the same implication: intergenerational transfers have no dynamic effects if the steady-state wealth of a migrant’s offspring remains below the critical level needed to get access to credit market. In case of large flow of remittances, more agents will be entitled for loans to undertake more rewarding entrepreneurial activity to reduce initial inequality. This supports the findings of Rapaport and Docquier (2005).

On the other hand, in the economy with remittances from children to siblings, the agent will try to maximize her lifetime utility described by equation (1.1) subject to the budget constraint described by equation (1.23). Therefore, equation (1.24), equation (1.25), and (1.26) continue to apply. The income of an agent is given by
\[ x_{t+1} = \begin{cases} (1 + i)(b_t + s + \alpha w) - \mu & \text{if subsistence,} \\ (1 + i)(b_t - k + \alpha w) + A - \mu & \text{if entrepreneurship.} \end{cases} \]  

(1.29)

where \( A - (1 + i)k > (1 + i)s \), as usual. The critical value of wealth will be

\[ \bar{b} = k - \frac{f}{1+i} - \alpha w \]  

(1.30)

As before, \( \bar{b} < \bar{b} \). As in the general version of the model, in this simplified version we also find that the critical level of wealth needed for borrowing is lower when remittances flow from children to siblings than when remittances flow from children to parents. The dynamics of wealth are described by

\[ b_{t+1} = \begin{cases} \frac{\beta}{(1+r)\mu} [(1 + i)(b_t + s + \alpha w) - \mu] & \text{if } b_t < \bar{b} \\ \frac{\beta}{(1+r)\mu} [(1 + i)(b_t - k + \alpha w) + A - \mu] & \text{if } b_t \geq \bar{b} \end{cases} \]  

(1.31)

In the general version of the model \( 1 + i > (1 - \theta)(1 + n) \) was the condition required for the shift of the transition paths to be greater when remittances are sent to siblings than when they are sent to parents. In the simplified version of the model, where \( n = 1, \theta = 1/2 \), this condition is satisfied unambiguously since \( 1 + i > 1, i > 0 \). Therefore, compared to the case when remittances flow from children to parents, inequality will be lower when remittances flow from children to siblings.

The migration decision is subject to liquidity constraint as is the case for accessing entrepreneurship. The cost of migration plays a critical role in the determining the wealth threshold above (below) which migration is plausible (implausible). Consider an agent born at time \( t \) who belongs to a dynasty that has never sent children abroad and who is deciding whether to send one of her own children abroad. From (1.29), the income of the agent if she decides to do this is \(^4\)

\[ x_{t+1} = \begin{cases} (1 + i)(b_t + s) - \mu & \text{if subsistence,} \\ (1 + i)(b_t - k) + A - \mu & \text{if entrepreneurship.} \end{cases} \]  

(1.32)

\(^4\) Note that there is no \( \alpha w \) term since this term corresponds to the remittance that the agent would receive if her siblings had been sent abroad, but no child in the dynasty has actually been sent abroad yet.
The agent decides on whether to send one of her own children abroad by comparing the utility from not doing so with the utility from doing so. The former is computed from (1.21) and (1.6).

\[
U_t = \begin{cases} 
U + (\gamma + \beta) \log((1 + i)(b_t + s)) & \text{if subsistence}, \\
U + (\gamma + \beta) \log((1 + i)(b_t - k) + A) & \text{if entrepreneurship}.
\end{cases}
\]  

(1.33)

And the latter is computed from (1.26) and (1.32) as

\[
u_t = \begin{cases} 
V + (\gamma + \beta) \log((1 + i)(b_t + s) - \mu) & \text{if subsistence}, \\
V + (\gamma + \beta) \log((1 + i)(b_t - k) + A - \mu) & \text{if entrepreneurship}.
\end{cases}
\]

(1.34)

When the agent is engaged in subsistence production, she will send one of her offspring overseas if

\[
V + (\gamma + \beta) \log((1 + i)(b_t + s) - \mu) \geq U + (\gamma + \beta) \log((1 + i)(b_t + s)) \quad \text{or} \quad \beta \log(2) \geq (\gamma + \beta) \log \left[ \frac{(1 + i)(b_t + s)}{(1 + i)(b_t + s) - \mu} \right] 
\]

(1.35)

Migration will always occur in the absence of migration cost, i.e., when \( \mu = 0 \). The right hand side of this condition is a decreasing function of \( b_t \) which implies that the condition is more likely to be satisfied at higher values of \( b_t \). If \( b \) denotes the critical value of \( b_t \) for which the condition holds with equality, then migration occurs if \( b_t \geq b \) and do not occur if \( b_t \leq b \).

Consider, next, the case in which the agent is an entrepreneur. The condition for sending one of her children abroad is now given by

\[
V + (\gamma + \beta) \log((1 + i)(b_t - k) + A - \mu) \geq U + (\gamma + \beta) \log((1 + i)(b_t - k) + A) \quad \text{or} \quad \beta \log(2) \geq (\gamma + \beta) \log \left[ \frac{(1 + i)(b_t - k) + A}{(1 + i)(b_t - k) + A - \mu} \right] 
\]

(1.36)

As above, the right hand side of this condition is a decreasing function of \( b_t \) and we can deduce the following. Let \( b \) denote the critical value of \( b_t \) for which the condition holds with equality: then migration occurs if \( b_t \geq b \) and do not occur if \( b_t \leq b \).
Proposition 5: Since $\overline{b} < \overline{b}$, the critical level of wealth required by an entrepreneur for sending one of her children abroad is lower than that required by a subsistence agent.

Migration incentives are stronger for the individuals belonging to the lower segment of the income distribution, but those belonging to the higher segment are less constrained; it is easier for the wealthier people to send children abroad. This supports the findings of Stark, Taylor and Yitzhaki (1986) and McKenzie and Rapoport (2004).

Fig 1.4 shows that an agent engaged in subsistence production will be able to send children abroad if her wealth is at least equal to $\overline{b}$. But migration, if not accompanied by adequate remittances, does not necessarily boost entrepreneurial activity and therefore, does not affect the income distribution of the recipient economy. There will be some remittance receiving households in the economy who will in fact live on low-yielding subsistence activity. This is the case when the flow of remittances shifts the transition path from (i) to (ix). The volume of remittances is not sufficient to affect the evolution of wealth such that agents can borrow from the credit market to set off private enterprise. However, large transfer of funds would shift the transition path from (i) to (x) and the agents become qualified to obtain loan from the financial market to undertake entrepreneurial activity.

Proposition 6: In the case in which the agent is engaged in subsistence production, migration occurs if $b_t \geq \overline{b}$, but entrepreneurship occurs only if $b_t \geq \overline{b}$.

1.9 Concluding Remarks

The present study is a contribution to the theoretical literature of remittances. It focuses on the role of remittances as a determinant of long-run income distribution. It can be viewed within the context of the contemporary literature on income distribution which emphasises the role of capital market imperfections in determining occupational choice. In the basic set up which takes into account an overlapping generations model of imperfect capital market, remittances are absent and access to entrepreneurship is restricted to relatively rich households whose inheritance exceeds a critical level of
wealth and make them eligible for a loan should they require one. Borrowing and lending take place through competitive financial intermediaries. Due to the presence of credit rationing, poor people are denied credit opportunities and are forced into subsistence occupation. In this economy, the limiting distribution of income depends fundamentally on the initial distribution of income.

Added to the above setup was the introduction of remittances in two different ways. In the first case, migrant children send remittances to their parents which results in higher intergenerational transfers, though not necessarily initiate a reduction in the extent of inequality when the remittance flow is not sufficiently high. In the second case, migrant children send remittances to their siblings which results in even greater intergenerational transfers. Moreover, it relaxes the borrowing constraint. A fall in the critical level of wealth implies that remittance flows will generate investment opportunity even for people belonging to the poor dynasties and thus have the potential to reduce the poverty and inequality significantly. This endogenous variation in critical wealth adds another aspect to the dynamics of income distribution. We extended the model further to allow for endogenous migration. We found that compared to subsistence agent, the entrepreneurs are less constrained for sending children abroad. We also found that in the economy there are in fact some remittance-receiving households who are engaged in low yielding subsistence activity. But since remittances enhance intergenerational accumulation of wealth, these remittance-receiving households will soon be able to overcome the wealth constraint to set up entrepreneurial activities. The households who do not have access to migration, once intergenerational wealth accumulation allows them to overcome the wealth constraint for migration, the flow of remittances would enhance their savings such that they get access to the capital market to setup businesses. Thus, the economy will converge to the unique long run income distribution.
Figure 1-1 Transition of Lineage Wealth (An Economy without Remittance)

Figure 1-2 Transition of Lineage Wealth (Remittance from Children to Parents)
Figure 1-3 Transition of Lineage Wealth (Remittance from Children to Siblings)

Figure 1-4 Endogenising Migration (Remittance from Children to Siblings)
Chapter 2

WHEN REMITTANCES ACCELERATE ENTREPRENEURIAL ACTIVITY?

2.1 Introduction

In the previous chapter our theoretical findings on remittances and entrepreneurship suggest that in case of large flow of remittances both types of intra-family transfer, i.e., remittances to parents or siblings, would raise the inter-generational transfer of wealth and relax borrowing constraint to facilitate entrepreneurship and reduce income inequality. In this chapter we tried to empirically estimate the extent to which household investment in entrepreneurial activity is affected by the receipt of remittances. One of the limitations of country-specific studies is that it may be inappropriate to compare the results when the studies collect data using diverse methodologies and obtain results applying different econometric techniques. This chapter contributes to the debate by examining household data of a number of Latin American countries where data collection method and econometric techniques applied are identical across countries. Our study, therefore, combines the advantages of country-specific and cross-country analysis. It takes into account country specificity since each country has been analysed separately allowing for all the possible country characteristics. It also captures the cross-country perspective since a large number of countries has been analysed using the same methodology. One interesting aspect of this study is to examine how the result obtained from microeconomic (household) data is linked with the macroeconomic (country-specific) observations.

Though we preferred to analyse each country separately, an alternative way of doing the analysis would be to pool the Latin American countries in a single sample to examine the average effect of remittances on entrepreneurial activity. An interaction term of remittances with country dummies may be included to unveil any country specific effects.
This chapter proceeds as follows. Section 2.2 reviews empirical literature on remittances and entrepreneurship. Section 2.3 presents regional observations and section 2.4 presents country-specific observations on flow of remittances. Section 2.5 describes the overall macroeconomic performance of some Latin American countries. Section 2.6 describes the microeconomic performance of some Latin American countries regarding remittances. Section 2.7 illustrates the empirical model specification issues and section 2.8 illustrates the econometric issues. Section 2.9 presents the main results. Section 2.10 comprises the summary of findings and concluding remarks.

### 2.2 Literature Review

A number of empirical studies examined how international remittances affect the marginal spending behaviour of the remittance recipients: whether remittances are channelled into human and physical capital, or used to purchase consumer goods. Adams (2005), using Guatemalan national household survey, found that the remittance receivers at the margin spend relatively less on food and more on housing and education compared to the remittance non-receivers. According to them, expenditures on housing have important second and third round effects on wages, employment and business opportunities; expenditures on education raises the level of human capital in the country as a whole. They found no evidence that the remittance receivers waste their remittance earnings on conspicuous consumption. Similarly, Tullao, Cortez and See (2007) found that remittance recipients have a higher allocation for housing, education, health care, and transportation compared to remittance non-recipients. They found similar results by estimating the expenditure elasticity using Engle functions.\(^6\) Remittance receivers have got higher expenditure elasticity for housing, education, health and transportation compared to remittance non-receivers. However, they found that remittance receivers’ labour force participation rate and employment rate are generally lower than the non-receivers. But, the Engle curve estimation did not take into account the endogeneity

\(^6\) An Engle curve, named after the 19th century German statistician Ernst Engle, shows the relation between income level and spending on the consumption of some good, at a given price. It describes how a consumer’s purchases of a good vary as the consumer’s total expenditures vary. A good’s Engle curve determines its income elasticity, for normal goods, the Engel curve has an increasing gradient.
issues, i.e., the fact that there could be a loop of causality between the independent and dependent variables.⁷

To resolve the endogeneity problem, some researchers used the instrumental variable (IV) approach.⁸ Yang (2008) used the exchange rate shock as an instrument for remittances. He found that the elasticity of exchange rate shocks on remittances is 0.60. Using data from four linked nationally-representative household surveys conducted by the national statistics office of the Philippine government during 1997-1998, he found that exchange rate shock is positively correlated with remittances and is exogenous to the households. A 10% rise in Philippine pesos per unit of foreign currency increases peso remittances by 6%. He examined how the level of expenditure is affected by the exchange rate shocks. He described that Filipino migrants all over the world experienced heterogeneous changes in exchange rates in the wake of the Asian financial crisis. In most of the cases, appreciation of a migrant’s currency against the Philippine peso leads to an exogenous increase in the volume of remittances from abroad. According to him, the exchange rate shock induced increase in the income of Philippine remittance receiver has negligible effects on household consumption but significant impact on human capital development. He found that exchange rate shock has a small positive impact on household overall entrepreneurial activity, but discernable impacts on specific entrepreneurial activities. He also found that the exchange rate shocks lead to greater entry and less exit from entrepreneurship in transportation and communication services, and manufacturing industries. A one-standard-deviation increase in the exchange rate shock results in net entry into transportation and communication services and manufacturing to increase by 1.2 and 0.9 percentage points, respectively. He explained that if households have complete access to credit, transitory shocks which induced an increase in income might have no effect on such investments; but since there exists

---

⁷ In econometrics, a parameter or variable is regarded as endogenous if there is a correlation between the parameter or variable and the error term. There occurs the problem of endogeneity if there exists measurement error, autoregression with autocorrelated errors, simultaneity, omitted variables, and sample selection errors. In sum, a loop of causality between the independent and dependent variables of a model leads to endogeneity.

⁸ Instrumental variable (IV) approach uses appropriate instruments that are well correlated to the endogenous explanatory variable but uncorrelated with the disturbance.
capital market imperfection, such increases in income allow investments that would not have otherwise been made.

Some studies described temporary migration to be the only means for accessing self-employment for many prospective entrepreneurs. Mesnard (2001), using a survey on return migrants of Tunisia, found that a small change in the initial distribution of wealth through temporary migration has a huge impact on the proportion of self-employed. In the 1980s, Tunisian return migrants financed 87% of the entrepreneurial projects by their savings accumulated abroad, only 13% got support from governmental programs, and none depended on commercial bank credits. Dustmann and Kirchkamp (2002) found that savings from abroad help the returnees to finance self-employment; in 1984 around 50% Turkish returnees from Germany established their own business within four years after their return and only 1.2% of them borrowed from commercial banks to finance their project.

Woodruff and Zenteno (2001) established the entrepreneurship enhancing impact of remittances in the context of capital market imperfections, with remittances relaxing the borrowing constraints of remittance receiver on farm investment and investment in micro enterprise. They used a survey of more than 6000 small firms located in 44 urban areas of Mexico. They found that remittances account for one fifth of the capital invested in micro-enterprises throughout urban Mexico. Within the ten states with the highest rate of migration to the US, they found that almost one third of the capital invested in microenterprises is associated with remittances. Lopez and Selingson (1991), using El Salvadorian data on small businesses, found that a significant part of total remittance income is directly invested into the businesses. They estimated that about one third of the businesses in El Salvador were established due to availability of remittances; but the future of about half of these businesses depend crucially on the continuity of remittance flow. Amuedo-Domates and Pozo (2006) recognised the joint determination of remittance receipt and business ownership. Using household survey data of Dominican Republic, they found that households involved in business activity are more likely to receive international remittances compared to those not involved in any business. Remitters transfer funds in order to exploit better investment opportunity back home and
also to retain bequest right. However, they found household remittance receipt to be associated with a lower household likelihood of business ownership.

In all the above mentioned studies the impact of remittances on business ownership was determined on the basis of country-specific observations and therefore, they may not be directly comparable. Moreover, the prevailing macroeconomic condition of the world in general and of the country in particular during the period of collection of data was not considered by any of these studies.

2.3 Regional Observations on Flow of Remittances

In this section we have considered two time periods (1) 1999-2003, when the Latin American Migration Project (LAMP) survey data, which we use in this study, were collected and (2) 2004-2008, the most recent data available. During these two time periods, on average the total global remittance flow doubled. Though, the share of the total received by Middle and Low income countries increased by 13.6%, the share of High income countries decreased by 25.26%. Therefore, the substantial increase in the total volume of remittances at global level can be attributed to the increased amounts sent to the Middle and Low income countries, the conventional exporters of labour. Regionally, in 1999-2003, the largest volume of remittances went to Latin America and Caribbean countries; in 2004-08 Latin America and Caribbean countries got the second largest volume [Figure 2-1]. During these two time periods, the growth of remittances was about two and half times higher in Middle and Low income countries compared to High income countries. Regionally, the highest growth of remittances was observed in Europe and Central Asia [Figure 2-2]. These figures actually underestimated the true magnitude of remittances as they depend on national balance of payment statistics which do not take into account international transfer through non-institutional channel (El-Qorchi, Maimbo and Wilson, 2003). A survey of Latin American immigrant in the US found that 15% of the total money transfer takes place while people travelling, hence remittance flow is undoubtedly underestimated by billions of dollars (Bendixon, 2002).
The size of remittance flow relative to the size of recipient economy illustrates the importance of remittances for that economy. During these two time periods, the size of remittances as a share of GDP and as a share of export were substantially higher for Middle and Low income countries compared to High income countries. Regionally, the remittance-GDP ratio and the remittance-export ratio were highest in South Asia [Figure 2-3 - Figure 2-4]. Since the last two decades, in Middle East & North Africa and Europe & Central Asia, the flow of remittances has been quite unstable. In Sub-Saharan Africa, it has been growing at an increasing rate only since the last few years. On the other hand, the flow of remittances to Latin American & Caribbean and East Asia & Pacific has been growing at an increasing rate with relatively minor annual fluctuation [Figure 2-5]. In the micro-econometric analysis which follows, we focus on Latin America and Caribbean countries.

In the last three decades, many Latin American and Caribbean countries experienced a number of financial crises. During 1982-90, the external debt crisis occurred as many of the Latin American countries failed to repay the huge foreign debt mainly due to the rise in the US interest rate and the deterioration in the exchange rate with the US dollar. Once again the Latin American countries faced a severe economic recession when the East Asian financial crisis of 1997 spilled over quickly, via Russia, to Brazil, thus, to Latin America. Influx of high interest seeking short-term capital from abroad during 1990-95, which financed the low equity heavy bank borrowing of these countries, started to be withdrawn during1997-98. The lack of regulations needed prior to opening of the capital account of the balance of payments was one of the main reasons behind this financial crisis. In 2001, another crisis began when the worldwide recession engulfed the Latin American region as a whole. The severe slowdown in the world economy adversely affected the region’s exports and the terms of trade. Pessimistic expectations drove down domestic demand. The growth of capital formation and GDP growth deteriorated [Figure 2-7]. The recession also had detrimental effect on the capital inflows; the growth of net official development assistance and FDI went down sharply. Although the growth of remittances declined during the time of the recession, it has always been positive and large over the years [Figure 2-8].
The significance of these huge remittance flows to the economies of Latin American & Caribbean countries becomes evident once they are compared to other key capital inflows. In the last two decades, remittances represent the second largest capital flow, well above the amount of total aid flow and close to the volume of total FDI flow. In these countries the volume of remittance flow continued to increase steadily, the volume of aid flow remained almost at the same level, but the volume of FDI flow fluctuated a lot [Figure 2-9]. We can also see that remittances as a percentage of total capital flow increased substantially, whereas FDI as a percentage of total capital flow decreased considerably over the years [Figure 2-10]. The debate on the risks and benefits of the globalisation of international capital markets focuses on the volatility of the key capital flows. Since the last few years, the volatility of remittance (i.e., coefficient of variation) in these Latin American countries decreased a lot; it is one third of that of FDI flow in order of magnitude [Figure 2-11].

The United States is the dominant source of remittance flow to Latin American countries. Orozco (2002) describes that about 90% of remittance flow to Latin American countries originates in the US. Latin American migrants choose US as their destination mainly for two reasons – size of the US economy and the distance from the country of origin. During 2000-08 foreign born Latin Americans in the US increased from about 17 to 21 million [Figure 2-12].

2.4 Country-specific Observations on Flow of Remittances

In order to understand the underlying heterogeneity of individual country, an in depth examination of stylized facts using a cross-country database is necessary. In this study, we used the Latin American Migration Project (LAMP) survey data and focused on Nicaragua, Haiti, Guatemala, Dominican Republic, and Costa Rica. The data on remittances we are interested in is available only for these Latin American countries. Before analysing the LAMP survey data, here we present some macroeconomic observations.

---

9 Volatility is the liability to vary over time. Most economic variables are volatile, but the degree of volatility varies across variables. It can be measured in absolute terms, or relative to trend. It is frequently measured by the coefficient of variation, i.e., the standard deviation divided by the mean for a series.
Over the years, the migrant-population ratio increased in many of these Latin American countries [Figure 2-13]. During 1999-2003, the contribution of remittances to GDP was quite large in Haiti, suggesting a rather heavy dependence of Haitian economy on remittances. In contrast, a remittance to GDP ratio was relatively small in Costa Rica and Guatemala [Figure 2-15]. The cross-country comparisons of growth of remittances also show variation across countries. During 1999-2003, in Nicaragua, the growth of remittances was quite stable; in Dominican Republic, the growth of remittances was relatively low; whereas, Guatemala, Haiti and Costa Rica suffered from huge fluctuation. [Figure 2-17]. During 1999-2003, comparatively higher degree of volatility of remittances was observed in Dominican Republic and Haiti; whereas in Nicaragua it was relatively small [Figure 2-18].

In sum, during 1999-2003 when LAMP survey data was collected, Nicaragua seems to have a more favourable position compared to other Latin American countries considered in this study in terms of the observed remittance-GDP ratio and the growth and volatility of remittances. To the extent that patterns of migration and remittances vary across countries and regions, the impact of remittances on investment is also likely to differ in ways that at present are still largely unknown. In this study we will look at possible cross-country differences in such developmental impact of remittances.

2.5 Macroeconomic Performances of LAC

In this section we will look into the overall macroeconomic performances of these Latin American and Caribbean countries during the time when the survey data was collected. For this, we made use of the data on several macroeconomic indicators presented in table 2-1 and we also considered the comparative analysis of the economies of Latin America and the Caribbean countries (UN, 2001).

During 2000-2002, when the LAMP-Nicaragua survey data was collected, the Nicaraguan economy slowed down. The GDP growth declined and there was a huge

---

10 Volatility means the liability to fluctuate over time; it is used to quantify the risk of capital flow over a specified time period. Volatility is often measured by the coefficient of variation, which is standard deviation divided by the mean for a series.
fiscal deficit. The deterioration in the terms of trade was mainly due to a significant loss of sales in Nicaragua’s main export products following drop in the international prices. The value of imports also declined due to reduced external purchases of intermediary goods and capital due to shrinking economic activity. The inflation and the current account deficit diminished during this period. To overcome the banking crisis, the central bank arranged a full guarantee for the deposits and liquidity support for those banks where interference was necessary. During this time, though the annual percentage growth of aid and FDI declined significantly, remittances remained an important source of financing for the current account deficit.

During 2000-2003, when the LAMP-Haiti survey data were collected, the GDP growth of Haiti worsened following the internal bottleneck and the external recession. Unstable political situation inside the country and the recession in the United States made the government unable to apply their economic policy appropriately. Fiscal revenues fell and also the government expenditure. The double digit inflation aggravated the unfavourable situation. The central bank continued to bear nearly the full burden of the fiscal deficit. The monetary authority expanded the liquidity through expansion of loans from the banking system. There was a sharp reduction in the external debt payments, which extended the vicious circle of non-payments and piled up the government arrears. The growth of aid deteriorated a lot and the growth of FDI was highly unstable. In contrast, though the growth of remittances suffered a drop, it had a quick recovery.

During 2000-2002, when the LAMP-Costa Rica survey took place, the gross domestic product deteriorated owing to the strong contraction in manufacturing and agriculture. Even though tax reform took place, the central government deficit expanded. The size of the total public debt reached more than half of the GDP. There was deterioration in the terms of trade. Unemployment and the trade gap increased considerably. The current account deficit rose: exports of goods contracted due to reduction in external demand; imports of goods contracted due to reduction in demand for capital good. There was high surges and withdrawal of aid, and FDI. But there was in fact an increase in the growth of remittances.
During 2004, when the LAMP-Guatemala survey took place, the GDP growth was quite low. The fiscal deficit and the growth of money and quasi-money were largely reduced. Unemployment rate increased considerably for several years in a row. The resurgence in inflation was owing to the nominal exchange rate depreciation and the increase in general price levels as a result of increase in the value added tax. There was continuous worsening of the terms of trade. Conflict between corporate groups and the government deteriorated the business climate and the private investment. As in the previous years, current-account deficit increased. There was a huge deterioration in the growth of remittances.

During 1999-2000, when the LAMP-Dominican Republic survey took place, the GDP growth rate decelerated. The slowdown of the economy pushed unemployment rate to a very high level. There was an upward pressure on prices; the level of inflation was raised. The performance of the external sector was characterized by the deterioration of the terms of trade; import grows massively relative to export. But due to a huge increase in the capital account balance, the overall balance of payment went up. There was severe decline in the growth of aid and FDI flow. The growth of remittance hugely deteriorated compared to its previous level.

In summary, when the LAMP survey data was collected, all these Latin American countries faced stagnation in the GDP growth and deterioration in the terms of trade. In Nicaragua, though the growth of aid and FDI worsened, the growth of remittances was quite high. In Haiti, the growth of aid, and FDI suffered huge drop. Though there was a fall in the growth of remittances, but it recovered rapidly. In Costa Rica, though there was huge fluctuation in the growth of aid, and FDI, there was actually an upsurge in the growth of remittances. But in Guatemala and Dominican Republic, the growth of remittances suffered from a huge deterioration.

### 2.6 Microeconomic Performances of LAC

Macro models are unable to control for individual and demographic differences. Moreover, the fact that official estimates underestimate the true value of remittances
creates a problem. While studying the impact of remittances on those receiving these transfers, macro data appears to be inadequate and the household survey data seems to be very useful. Latin American Migration Project (LAMP) was designed to collect information on Latin American migration to the United States. It gathered information on both the remittance receivers located at the home country as well as the remittance senders located at the destination country. It thus secures information from households who might never return back to their original communities. LAMP began its operation with a set of surveys conducted in Puerto Rico (1998), later on it carried out fieldwork in the Dominican Republic (1999-2000), Peru (2001), Nicaragua (2000-02), Costa Rica (2000-02), Haiti (2000-03), and Guatemala (2004). For each country a variety of communities of different sizes, regions, and ethnic compositions was selected in order to provide a basis for comparative study and generalization. In addition to basic demographic data, the survey provides information on family composition, fertility, infant mortality, marital history of the household head, labour history of the household head and his/her spouse, and ownership history of properties and businesses. Moreover, in most cases detailed information have been provided on internal migration, migration to the mainland US, and multiple aspects of key US trips, for instance, work experience, income, social networks, remittances, etc. Though due to limitations in the data, the study could not cover all the countries in the Latin American region, but essentially it covers many of the Latin American and Caribbean countries that are receiving nontrivial amounts of remittances. From the descriptive statistics provided in Table 2-2, we could see that in case of Nicaragua the number of households interviewed and the population in sample is largest among the Latin American countries considered in this study. Appendix-1 provides more detail on LAMP household survey.

### 2.6.1 Descriptive Statistics (Remittance Sender)

Table 2-3 demonstrates that a relatively smaller portion of Nicaraguan migrants send remittances back home. Nicaraguan migrants seem to be relatively well educated. A relatively higher proportion of them are married. The gender distribution of Nicaraguan migrants tends to be more equal. In case of Haiti, the mean age of migration is lowest among others. Though a large proportion of Haitian migrants send remittances back
home on a regular basis, the average monthly remittances are the smallest among others the Latin American countries considered in this study. The proportion of Guatemalan migrants sending remittances back home on a regular basis is largest among others implying that the recipients are heavily dependent on remittance income. Most of the Guatemalan migrants are male; they are relatively less educated, they send remittances to their family back home mainly to smooth consumption. In case of the Costa Rican migrants, the mean duration of their first trip to the US is the smallest and the average monthly remittances are the largest among others. A small proportion of Dominican migrants are married at the time of their first trip to the US and the mean duration seems to be quite high. Large fraction of Dominican migrants reported that they send remittances to finance investment in productive activities.

In sum, most of the migrants of these Latin American Countries are male who were at their prime age at the time of their first trip to the US. The trips are relatively shorter for the countries closer to the US (e.g., Costa Rica, Guatemala, and Nicaragua) and longer for the islands distant from the US (e.g., Dominican Republic, Haiti). On average the migrants send about $200/month. The main remitting purpose of the migrants includes consumption and asset accumulation. Though consumption is the overwhelming purpose of migrants’ remitting practice, asset accumulation has been cited by a reasonably large portion of migrants. But the intended usage of remittances not always coincides with reported usage of remittances. Using the data from remittance receiver on reported usage of remittances, a better understanding of the relationship between remittances and capital investment can be attained.

### 2.6.2 Descriptive Statistics (Remittance Receiver)

The descriptive statistics in table-2-4 provides some very useful insights. Though remittance income is a common element of household income in these Latin American countries, there exists considerable heterogeneity across countries in terms of the volume of transfer. In these countries on average about one fourth of the households receive

---

11 Consumption includes food and maintenance, purchase of consumer goods, and financing entertainment and asset accumulation includes purchase/repair of a house, start/expand a business, purchase of land and vehicle, livestock, and agricultural input, educational and health expenses, and savings.
remittances. LAMP only provides information on whether the amount of remittances received is a small, medium or large portion of remittance recipient’s total income. In the majority of the cases, remittances account for a large portion of household income. There also exists substantial variation in the years of schooling attended among the remittance receivers. Cross-country differences can also be found with regard to the share of remittance receiving household head being employed. The remittance receivers usually purchase houses, land and vehicle with the money they receive from abroad.

Table 2-4 demonstrates that in Nicaragua, for a considerable proportion of remittance-receiving households, these transfers constitute a small portion of their income. A large fraction of remittance receiving household heads belongs to the age group>55. In Haiti, a huge portion of household heads reported to receive remittances from abroad. The remittance receiving household heads seem to be mostly male and relatively more educated, belonging to the highest tier of the education spectrum; they are mostly employed. A large portion of Haitian (current) remittance receivers purchases house of residence and vehicles with the transferred fund. Guatemalan households appear to be very much dependent on remittances; most of them consider remittances to be a substantial proportion of their income. They are located in the lower end of the education spectrum, a very small number of them complete the tertiary education. In Costa Rica, only a small part of households realize an increase in nominal income from these remittance flows. A fairly large fraction of Costa Rican remittance receivers are married. According to the reported usage, many Costa Rican remittance receivers purchase land with remittances. In Dominican Republic, a relatively large fraction of the remittance receiving household head belongs to the age group<=35 and are female. A relatively small part of these remittance receivers belongs to the employment pool implying that they are likely to spend the remittance income to meet their living cost.

Table 2-4 also demonstrates that in Nicaragua, those who are receiving remittances, among them, 47.43% are doing business. Those who are not receiving remittances, among them, only 43.54% are doing business. Entirely opposite situation can be noticed in Dominican Republic; among remittance receiver only 22.58% are engaged in business and among remittance non-receiver 30.51%, are engaged in business. Therefore, the
impact of remittances on entrepreneurship is likely to be different across countries and our study will try to find the reasons behind this.

2.7 Empirical Model Specification Issues

The LAMP survey gathered information on the incidence of remittance receipt, but not the actual size of this international transfer. It collected information on business activity, whether the household currently owns one or more businesses. Therefore, the data only allow us to consider business ownership and remittance receipt in our empirical study as two binary variables. Since our main interest is to find to what extent the receipt of remittances affects household investment in business activity, it is important to understand the various ways in which remittances and business ownership can be correlated. (i) Remittance receipt can influence business ownership by easing credit constraint of the potential entrepreneurs (ii) Households owning businesses can attract greater remittance inflows, if migrants consider family business to have valuable investment prospect and source of future bequests (Hoddinott 1994, (de la Brière et al. 2002) (iii) Conversely, household entrepreneurship can attract smaller remittances when migrants consider family members back home to be economically well off (de la Brière et al, 2002). We need to address the bi-directional relationship between business ownership and remittance receipt while examining the likely impact of remittances on business ownership since the failure to address such endogeneity will produce inaccurate inferences.

In the model of household business ownership, several household head characteristics, e.g., age, sex, marital status, and educational attainment, were incorporated as explanatory variables in order to account for their likely influence on household business investments. Complementary business resources, i.e., imported human capital, availability of assets, etc, were also considered. Since the importation of human capital is likely to facilitate entrepreneurial activity (McCormick and Wahba, 2001), the percentage of household members with US past experience were taken into consideration. Past land holding by the households was included to control for the availability of wealth possibly used as collateral to set up business. Moreover,
demographic control, e.g., the percentage of non-working-age family members, was added into the model to control for the availability (or lack) of household labour to assist business activities (Amuedo-Dorantes and Pozo, 2006). Finally, to recognise the regional characteristics potentially influencing business investments, we included a set of community dummy variables; these will capture existing business climates in different communities. Consequently, the household business ownership model takes the shape as follows

\[ \text{Business}_i^* = \alpha + \beta X_i + \gamma Z_i + \lambda D_i + \epsilon, \]

\[ \text{Business}_i = 1 \text{ if } \text{Business}_i^* > 0, 0 \text{ otherwise} \]

In equation (2.1), Business\(_i^*\) is the latent variable and Business\(_i\) is the observed variable. Business\(_i\) is equal to 1 if the household has business ownership; otherwise it is 0. Remittances\(_i\) is a dichotomous variable representing whether or not the household is receiving remittances from abroad. \(X_i\) is the vector of personal characteristics of the \(i\)th household head – i.e. age, age-squared, sex, marital status, and years of education. The variable age is expected to facilitate business ownership, but an increase in age towards the end of the career might show a drop-off, and this is why we control for a quadratic term of the variable age. \(Z_i\) is the vector of variables comprising the percentage of household members with US past experience, the percentage of non-working age household members, and past land holding by the household. \(D_i\) is the vector of the set of community dummy variables.

While modelling the household’s likelihood of receiving remittances, household’s financial status was considered by including household head’s current employment status and household’s current land holding. The percentage of non-working-age family members was considered to account for the economic dependency. Moreover, the percentage of household members currently residing abroad has been included as it is likely that the higher the percentage of family members living abroad, the larger the amount of remittance flow the household can expect to receive. Finally, a set of community dummy variables have been added to capture the difference in banking
facilities available in the communities for managing the international remittance transfers.\(^{12}\) Therefore, remittance receipt can be modelled as:

\[
\text{Remittances}_i^* = \beta_2' X_{2i} + \gamma_2' Z_{2i} + \lambda_2 D_2 + \epsilon_2, \tag{2.2}
\]

\[
\text{Remittances}_i = 1 \text{ if } \text{Remittances}_i^* > 0, 0 \text{ otherwise}
\]

In equation (2.2), Remittances\(^*_i\) is the latent variable and Remittances\(_i\) is the observed variable. Remittances\(_i\) is equal to 1 if the household receives money transfers from abroad; otherwise it is 0. \(X_{2i}\) is the vector of household’s financial status, i.e., current employment status of the household head and current land holding by the household. \(Z_{2i}\) is the vector of variables comprising information on the percentage of non-working age household members and the percentage of US migrant per household and \(D_2\) is the vector of the set of community dummy variables. Appendix-2 contains details about the construction of the variables using the LAMP household data set.

### 2.8 Econometric Issues

Business ownership and remittance receipt are two simultaneously determined binary variables. Not only the receipt of remittances is likely to influence the likelihood of the business ownership, but also the receipt of remittances is thought to be endogenous to the household’s business activity back home. The traditional ordinary least square (OLS) which considers a unidirectional relationship between the dependent and the independent variable will produces biased and inconsistent estimator in the presence of endogeneity. The instrumental variable (IV) approach is often adopted to deal with such problem, but it is not always easy to find appropriate instruments. When the dependent and the independent variable are jointly determined simultaneously, an extension of OLS, e.g., the simultaneous equation model (SEM) and seemingly unrelated regression model (SUR) are often used. But when the dependent variable is a binary variable, applying these econometric techniques will be inappropriate. Due to the potential simultaneity of

\(^{12}\) Categorical variables are a way of incorporating qualitative information into regression analysis; they can become a predictor in a regression when they are expressed as one or more \{0,1\} dichotomies called “Dummy variables”. Any regression analysis involving information such as region of residence would use dummy variables if there is a reason to suspect that there exist regional differences. For \(k\) categories, \(k\) dummies can be defined but only \(k-1\) of the dummy variables can be included in the regression.

household business ownership and remittance receipt, the estimation of regression equation (2.1) and (2.2) as separate probit models might produce misleading results. The recursive bivariate probit model, proposed by Maddala (1983) and developed further by Greene (1998, 2003), offers appropriate treatment if the dependent variable is a binary variable and one of the important covariates is likely to be jointly determined and is a binary variable. Therefore, in the present research recursive bivariate probit model has been used to account for the plausible joint determination and endogeneity issues while assessing the impact of remittances on business ownership. The functional form of the recursive bivariate probit model is as follows

\[
y_1^* = \beta_1' x_1 + \gamma_1 y_2 + \epsilon_1, \quad y_1 = 1 \text{ if } y_1^* > 0, 0 \text{ otherwise} \tag{2.3}
\]

\[
y_2^* = \beta_2' x_2 + \epsilon_2, \quad y_2 = 1 \text{ if } y_2^* > 0, 0 \text{ otherwise}
\]

where \( y_1 \) is the binary dependent variable of interest, the second binary dependent variable, \( y_2 \), appears on the right hand side of the first equation; \( x_1 \) and \( x_2 \) are corresponding regressor vectors of two regression equations. The disturbance \( \epsilon_1 \) and \( \epsilon_2 \) are normally distributed with a correlation of \( \rho \); the correlation coefficient measures the effect after the influence of the endogenous variable is accounted for in the first equation. This equation system is identified if there is at least one exogenous variable in \( x_2 \) that is not included in \( x_1 \) or if disturbances are independent, i.e., \( \text{corr}(\epsilon_1, \epsilon_2) = \rho = 0 \). If the equation system is identified, the endogenous nature of variables on the right-hand side of the first equation can be ignored in formulating the log-likelihood function (Maddala, 1983). If the null hypothesis \( \rho = 0 \) is not rejected, it means that the correlation of disturbances is not statistically different from zero. In this case the two equations can be estimated independently as two separate probit models. In other words, the model collapses to two separate probit models for \( y_1 \) and \( y_2 \) if \( \rho = 0 \). In this situation the binary response model and recursive bivariate probit model produce similar results (Greene, 2003). Appendix-3 presents more details on probit, bivariate probit and recursive bivariate probit model.

Due to the nonlinear nature of the probit model, the marginal effect for continuous independent variables and the discrete change for binary variables are very useful to interpret results adequately (Greene, 1998). There are mainly two methods of estimating
marginal effects. (i) AME (average marginal effect): it is the computation of the average of discrete or partial changes over all observations (ii) MEM (marginal effects at the mean: it is the computation of marginal effects at fixed values (e.g., sample means) of the independent variables. In the literature, the discussion of which of these two methods should be used seems to be inconclusive. In this study we used MEM. According to Greene (1997), MEM is a good (asymptotically valid) approximation of AME. Moreover, our regression model includes (i) dummy variables and (ii) continuous variables that are mathematical transformations of each other. Bartus (2005) found that MEM is useful to obtain correct marginal effect when sets of dummy variables are included in the model and correct total marginal effects when the regression model includes polynomial term of a variable. Appendix-4 presents details on marginal effect and total marginal effect.

2.9 Results

Empirical findings from LAMP-NIC9 (Nicaragua), LAMP-HA3 (Haiti), LAMP-GUA3 (Guatemala), LAMP-CR7 (Costa Rica), and LAMP-DR7 (Dominican Republic) are presented in this section. The equation system is identified as the percentage of household members currently residing in the US, an exogenous variable, is included in $X_2$ that is not included in $X_1$. Other than through remittances itself, there is no prior reason to believe that the percentage of household members residing in the US would affect the likelihood of household business ownership once we control for household composition. Since our focus is to understand the link between the remittances and entrepreneurship in the recipient country, we focus only on the households located in the home country and therefore, drop the households settled in the US while doing the analysis.

Table-2-5 presents the results from recursive simultaneous bivariate probit regression. In Nicaragua, the regression result from the model of household likelihood of business ownership [equation (2.1)] shows that the households receiving remittances from abroad, though not significant at any conventional level, are more likely to own a family business. Family business ownership is directly and significantly related to the household
head’s characteristics, e.g., age and marital status. Moreover, Household’s US past experience and past land holding has significant direct influence on the probability of household being an entrepreneur. We also found a lower percentage of non-working-age household members to be associated with a higher likelihood of business investment. On the other hand, the regression result from the model of household likelihood of receiving remittances [equation (2.2)] shows that the percentage of household members currently residing abroad is positively correlated and household head’s employment status to be negatively correlated with the incidence of remittance receipt.

Table 2-5 also shows that in case of Nicaragua, $\rho = -0.06$ (chi-square = 0.27, df = 1, $p = 0.60$). It means that there is no significant correlation between the disturbances of equation (2.1) and (2.2). Therefore, the null hypothesis, $\rho = 0$, can be accepted which implies that the two equations of recursive simultaneous bivariate probit model can be estimated as two separate probit model using maximum likelihood as the estimation criterion. In fact, the null of zero correlation cannot be rejected for all Latin American countries considered in this study. Hence, we estimated equation (2.1) and (2.2) as separate probit model for all these Latin American countries, but presented the results of the former since our main interest is to understand whether remittances enhance the probability of business ownership.

Table 2-6 reports the probit regression result of the model of household likelihood of business ownership using equation (2.1). The columns of table 2-6 report estimated coefficients, robust standard errors for the likelihood of entrepreneurship. We also reported partial effects of each explanatory variable evaluated at sample means (MEM). The regression model contains age-squared which is a mathematical transformation of age and therefore, we reported the total effect of age as the sum of the direct effect of age and its indirect effect created by age squared. We jointly tested the community dummies for significance. There are $k$ community dummies for each country, one for each community within a country. We performed the joint test for the coefficients of community 2 … community $k$ equalling zero. In case of Nicaragua, we found $\text{chi}^2(8) = 92.63$ and Prob $> \text{chi}^2 = 0.00$ implying that the null that each of those coefficients is zero can be rejected. In fact, the null can be rejected for all Latin American countries included
in this study implying that the incidence of business ownership does differ according to the qualitative factor “community” and hence justifies the inclusion of the dummies.

The probit regression result in Table 2-6 also shows that in Nicaragua there is a significant (at 10% level) direct relationship between remittance receipt and business ownership. Household head’s age significantly increases the likelihood of owning a business. Moreover, household head’s marital status, a higher percentage of working-age household members, US past experience and past land holding significantly increases the possibility of business occupancy. Analysis of marginal effect shows that remittance recipients have 7 percentage point higher probability of being in business. Past land holding and marriage increases the likelihood of owning a business by 19 and 8 percentage points, respectively. We also find that if the percentage of non-working age household members decreases by 10 percentage points, the probability of owning a business increases by approximately 4 percentage points and if the percentage of the household members with US past experience increases by 10 percentage points, the probability of business holding increases by about 1 percentage points. The total marginal effect of household head age on business ownership is fairly small, only 0.002 per 10 percentage point change.

In Haiti, we could see, though not significant at any conventional level, that remittance receipt facilitates business ownership. Male household head are more likely to own a business. A lower percentage of non-working-age household members and lower level of educational attainment is related with a higher possibility of business occupancy. Marginal effect illustrates that male-headed households are 15 percentage points more likely to be engaged in entrepreneurial activity. 10 percentage point decrease in the non-working-age household members raises the probability of business ownership by about 0.04. Though the effect is very minimal, education reduces the probability of business occupancy in case of Haiti; an increase in household head’s educational attainment by 10 percentage point reduces the probability of business ownership by 0.002.

In Costa Rica, we again find a positive association between receipt of remittance and entrepreneurship, though not significant at any conventional level. The result also shows
significant direct relationship between household head’s personal characteristics (i.e., age, sex, marital status, education) and business ownership. Availability of household labour, US past experience and past land holding increases the probability of business occupancy. The effect of household age on entrepreneurship is very small, only 0.001 per 10 percentage point change. Male-headed households are 7 percentage points more likely to be engaged in entrepreneurial activity. The incidence of being married and past land holding increases the likelihood of entrepreneurial activity by 13 and 26 percentage points, respectively. Moreover, an increase in household head’s years of schooling and in the supply of household labour by 10 percentage point raises the probability of business ownership by 0.001 and 0.01, respectively.

In Guatemala, probit regression implies a positive association between household head’s age, and business ownership. Higher percentages of household members with working ability and US past experience are related to a higher likelihood of business occupancy. Total marginal effect reveals that the effect of household age on business ownership is very small, only 0.001 per 10 percentage point change. The probability of holding a business increases by around 2 percentage points if the non-working-age household members decrease by 10 percentage points. The result also demonstrates that if the percentage of household members with US past experience increases by 10 percentage points, the likelihood of entrepreneurial activity would increase by about 2 percentage points. However, the result does not show a direct relationship between remittances and business ownership; there is in fact an insignificant negative association. It implies that households receiving remittances from abroad are not more likely to be in possession of a business than households not receiving such international transfer.

In Dominican Republic there is a significant direct relationship between household head’s personal characteristic (e.g. age, sex, and marital status) and business ownership. US past experience, past land holding, and household labour supply facilitate business activity. However, in case of Dominican Republic, a significant negative association between remittance receipt and business ownership can be identified. Marginal effect shows that if the percentage of household labour supply and the percentage of household members with US past experience increases by 10 percentage points, the probability of
owning a business increases by about 2 and 3 percentage points. As before, the total marginal effect of household head age on household business ownership is very small, only 0.001 per 10 percentage points change. Household with male heads, marital status and past land holding have 15, 8 and 29 percent higher probability of being engaged in entrepreneurial activity, respectively. But remittance receiving households are less likely to be in business since the marginal effect implies that receiving remittances reduces the probability of being in business by 0.12.

In sum, the probit regression results illustrate that in most of these Latin American countries, household head’s age, sex, and marital status, and decrease in non-working-age household members increases the likelihood of business ownership. Households with US work experience and past land holding has higher probability of doing business. The results also indicate that the magnitude of the impact of remittances on business investment varies across countries. Countries are not equally capable of exploiting the potential benefits of remittances.

The way countries advantaged from remittances is likely to be related to the countries’ own macroeconomic environments. For instance, in some developing countries, financial institutions have been able to get access to international capital markets under favourable conditions through future remittance-backed securitization. Remittances have been used by many emerging market issuers as collateral against borrowing several billion dollars a year on easier terms from international capital market. In 2001, Banco do Brasil used yen transfers from Brazilian migrants while issuing US$300 million worth of bonds (with five year maturity) on generous terms compared to other independent issues. To get hold of external financing, Mexico and El Salvador have also used future remittance backed securities (Ketkar and Ratha, 2001). We, therefore, argue that before sanctioning credit to prospective entrepreneurs who actually accumulated necessary collateral through the receipt of remittances, the financial intermediaries would potentially assess the overall macroeconomic trend of remittances in that country. Remittances are more likely to lift financial and liquidity constraint of potential entrepreneurs if capital market anticipates a smooth upward trend of such international transfer.
Remittances ease credit constraint and promoted entrepreneurial activity in Nicaragua, where at household level the recipients are more likely to get a regular and increasing flow of remittances. From the country specific observations, we came to know that during the period when LAMP survey data was collected, although the worldwide recession engulfed the Latin American region as a whole, the performance of Nicaragua was better than other Latin American countries in terms of the growth and volatility of remittances. During this time, though the annual percentage growth of aid and FDI declined significantly, remittances remained an important source of foreign capital in Nicaragua.

We found positive but insignificant impact of remittances on entrepreneurship in Haiti and Costa Rica. In Haiti, when LAMP survey data was collected, although the growth of remittances initially deteriorated, there was a quick recovery. In Costa Rica, there was in fact an improvement in the growth of remittances; it changed from a consecutive negative growth to a more or less consecutive positive growth. In Guatemala, we found remittances to exert insignificant negative impact on business ownership, whereas in Dominican Republic we found a significant negative association between remittances and entrepreneurship. When LAMP survey data was collected, in Guatemala and Dominican Republic, the growth of remittances was not only low, it also suffered from a huge deterioration. We found the volatility of remittances to be considerably higher in Dominican Republic compared to other Latin American countries considered in this study. Such unstable remittance flow was not supportive of smooth savings and therefore, did not promote business investment in Dominican Republic.

Since the LAMP data provide information on the relative size of remittances that households are receiving, we directly examined whether the likelihood of business ownership increases with the size of remittances. LAMP provides information on whether the remittances are small medium or substantial relative to the remittance receiver’s income, and so we added three binary dummy variables (small, medium, and substantial) instead of the current one (whether household receive remittances) to examine how the magnitude of remittances relative to household’s income affect the likelihood of household’s business ownership. In table 2-7, analysing the marginal
effects we could see that in Nicaragua, those who are receiving remittances as a small part of their income are more likely to own a business compared to those who are receiving remittances as a medium/substantial part of their income. In Costa Rica, those who are receiving remittances as a medium part of their income are more likely to own a business compared to those who are receiving remittances as a large part of their income.

It is difficult to explain the results when remittances are a ratio of household’s income. However, fig 1-4 of chapter 1 can be used to explain why the remittance recipients who receive remittances as a small part of their income are more likely to be involved in entrepreneurial activities. In the theoretical model of chapter 1, we found that if remittances enhance savings of the recipient such that they overcome the borrowing constraint, they will be able to set up businesses. In fig 1-4 of chapter 1, for a given amount of transfer, remittances are a large part of income to those individuals whose level of income is close to $\tilde{b}$, and for them it is more difficult to overcome the wealth constraint $\tilde{b}$ to get access to capital market to instigate entrepreneurship. In contrast, remittances are a small part of income to those individuals whose level of income is close to $\tilde{b}$, and it is relatively easier for them to overcome the critical $\tilde{b}$. This potentially explains why in Nicaragua and Costa Rica we found those who are receiving remittances as a small part of their income are more likely to be involved in entrepreneurial activities. However, in Dominican Republic, we found all the remittance recipients are significantly less likely to own a business compared to the remittance non-recipients. As mentioned earlier, small and irregular flow of remittances to Dominican Republic (during the time when the LAMP-DR survey data was collected) could be a reason why we got such an inverse relationship between business ownership and remittance receipt. In case of Dominican Republic, we tested the equality of coefficients, i.e., whether the coefficients of three binary dummy variables (small, medium, and substantial) are significantly different from each other and we could not reject the null that they are equal to each other. So in Dominican Republic, there is no significant difference among different size of remittances in their effect on business ownership.
2.10 Concluding Remarks

The present research is intended to empirically estimate how the probability of business ownership is conditioned by the incidence of household remittance receipt. One of the main reasons of using the LAMP data was that it ensures a high degree of representativeness at the country level. LAMP household survey gathered information on several Latin American countries using similar methodology and questionnaire and provides a basis for comparative study and generalization. It is difficult to compare the results of country-specific studies when they depend on diverse methodologies and assumptions. One of the main strength of our study is that it combines the advantages of country-specific analysis and cross-country analysis. It reflects country specificity since each country has been analysed in isolation considering all the possible country characteristics. It serves the cross-country perspective since similar data of a large number of countries have been analysed using same econometric techniques. There is no methodological bias and the results can be used to understand the potential heterogeneity across countries in response to a surge in remittances.

In the LAMP household survey, the dependent variable, business ownership, is a binary variable and one of the important covariates, remittance receipt, which is likely to be jointly determined, is a binary variable as well. In our study, we used the recursive bivariate probit model as it appropriately deals with the potential simultaneity and endogeneity issues when both the dependent and the endogenous variables are binary. But since the two equations of the recursive simultaneous bivariate probit model have been found not to be strongly associated for all the Latin American countries considered in this study, we estimated these equations as separate probit models. Our main interest was to understand whether receipt of remittances enhance the likelihood of entrepreneurial activity. The measured impact of remittances on business investment reveals significant country heterogeneity. Results from probit regression show that in case of Nicaragua international remittances promote business investment. But in case of Haiti and Costa Rica there is positive but insignificant impact of remittances on entrepreneurship. On the other hand, in case of Guatemala and Dominican Republic, remittance receipt appears to be associated with a lower likelihood of business
ownership. Though in Guatemala, the negative effect of international remittances on entrepreneurship is not significant at any conventional level, in Dominican Republic it is significant indeed. We therefore came across the question why does remittance receipt promote the likelihood of business ownership in some countries but not in other countries? One interesting aspect of this study is that we tried to understand whether the results obtained from microeconomic (household) data can be linked with the macroeconomic (country-specific) observations. We argue that the financial institutions would consider the trend of remittance flow at macro level before considering savings from remittances as collateral against bank loan since smooth and increasing trend would reduce the risk of defaulting in repayment of loan. We learned that when LAMP-NIC9 survey data was collected, Nicaragua was enjoying relatively large, stable and increasing flow of remittances and we found that in Nicaragua remittance receivers are more likely to become entrepreneur compared to remittance non-receivers. In contrast, Dominican Republic was suffering from smaller and irregular flow of remittances when LAMP-DR7 survey data was collected and we found that in Dominican Republic remittance receivers are less likely to have business ownership compared to remittance non-receivers. Therefore, remittances seems to facilitate entrepreneurship at micro level in those countries where the lenders of the capital market can predict smooth and increasing flow of remittances at macro level. We also found that in Nicaragua and Costa Rica, those who are receiving remittances as a small/medium part of their income are more likely to own a business compared to those who are receiving remittances as a large part of their income.

However, ML estimation of the probit model relies on the assumptions that the latent error term is normally distributed and homoscedastic. The ML estimator would be inconsistent in the presence of heteroscedasticity and robust covariance estimators cannot solve this. Several semi-parametric estimation strategies have been proposed that relax the distributional assumption about the error term (Horowitz and Savin 2001, Gerfin 1996), but the use of these techniques is very limited. Moreover, it would have been better if we could make use of longitudinal data on the receipt of remittances by the household over time in order to assess the impact of this flow variable on household
business investments over time. But, such data is still not available for these Latin American countries and is subject to future research.
Source: Author’s calculation using data from WDI (world development indicators, 2009)
Source: Author’s calculation using http://www.migrationinformation.org/datahub/historicaltrends.cfm and data from WDI (world development indicators, 2009).
Figure 2-13 Migrants from LAC to USA

Figure 2-14 Remittance Flow to Different LAC

Figure 2-15 Remittance as a % of GDP in LAC

Figure 2-16 Remittance as a % of Export in LAC

Figure 2-17 Growth of Remittances (% of GDP) in LAC

Figure 2-18 Volatility of Remittances in LAC (1990-08)

Source: Author’s calculation using http://www.migrationinformation.org/DataHub/countrydata/data.cfm and data from WDI (world development indicators, 2009).
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nicaragua</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDP (ann. % growth)</td>
<td>3.97</td>
<td>3.71</td>
<td>7.04</td>
<td>4.10</td>
<td>2.96</td>
<td>0.75</td>
<td>2.52</td>
<td>5.31</td>
<td>4.35</td>
<td>3.69</td>
<td>3.90</td>
<td>3.50</td>
</tr>
<tr>
<td>Money &amp; quasi money (ann. % growth)</td>
<td>52.54</td>
<td>32.15</td>
<td>18.81</td>
<td>9.38</td>
<td>4.11</td>
<td>13.30</td>
<td>12.64</td>
<td>7.86</td>
<td>6.5</td>
<td>5.6</td>
<td>5.2</td>
<td>5.1</td>
</tr>
<tr>
<td>Real effective exchange rate (2005=100)</td>
<td>151.61</td>
<td>154.96</td>
<td>114.97</td>
<td>114.01</td>
<td>113.53</td>
<td>108.80</td>
<td>102.59</td>
<td>100.04</td>
<td>100.00</td>
<td>100.61</td>
<td>101.09</td>
<td>107.81</td>
</tr>
<tr>
<td>Unemployment (% of total labour force)</td>
<td>13.3</td>
<td>13.2</td>
<td>10.9</td>
<td>9.8</td>
<td>6.4</td>
<td>12.2</td>
<td>7.8</td>
<td>6.5</td>
<td>5.6</td>
<td>5.2</td>
<td>5.1</td>
<td>5.0</td>
</tr>
<tr>
<td>Cash surplus/deficit (% of GDP)</td>
<td>-0.65</td>
<td>-0.53</td>
<td>-2.18</td>
<td>-3.10</td>
<td>-5.92</td>
<td>-1.14</td>
<td>3.49</td>
<td>8.19</td>
<td>6.17</td>
<td>6.07</td>
<td>16.25</td>
<td>1.92</td>
</tr>
<tr>
<td>Exports of goods &amp; services (ann. % growth)</td>
<td>14.36</td>
<td>5.79</td>
<td>12.35</td>
<td>12.35</td>
<td>7.35</td>
<td>63.51</td>
<td>9.18</td>
<td>17.11</td>
<td>9.46</td>
<td>10.55</td>
<td>9.69</td>
<td>4.69</td>
</tr>
<tr>
<td>Imports of goods &amp; services (ann. % growth)</td>
<td>22.13</td>
<td>7.22</td>
<td>21.11</td>
<td>-4.74</td>
<td>0.70</td>
<td>-0.14</td>
<td>3.49</td>
<td>8.19</td>
<td>6.17</td>
<td>6.07</td>
<td>16.25</td>
<td>1.29</td>
</tr>
<tr>
<td>Terms of Trade (2000=100)</td>
<td>109.00</td>
<td>113.68</td>
<td>105.38</td>
<td>100.00</td>
<td>88.41</td>
<td>87.00</td>
<td>84.05</td>
<td>82.50</td>
<td>81.37</td>
<td>78.61</td>
<td>78.64</td>
<td>75.16</td>
</tr>
<tr>
<td>Current account (millions of $)</td>
<td>-840.77</td>
<td>-684.64</td>
<td>-928.38</td>
<td>-841.90</td>
<td>-805.00</td>
<td>-744.10</td>
<td>-663.00</td>
<td>-648.70</td>
<td>-734.27</td>
<td>-710.20</td>
<td>-1000.60</td>
<td>-1512.90</td>
</tr>
<tr>
<td>Capital &amp; financial account (millions of $)</td>
<td>520.68</td>
<td>827.94</td>
<td>1227.91</td>
<td>636.21</td>
<td>569.80</td>
<td>1062.85</td>
<td>782.44</td>
<td>1063.89</td>
<td>791.68</td>
<td>829.95</td>
<td>980.22</td>
<td>1182.89</td>
</tr>
<tr>
<td>Overall balance of payment (millions of $)</td>
<td>-320.09</td>
<td>141.30</td>
<td>299.53</td>
<td>-205.69</td>
<td>-235.20</td>
<td>318.75</td>
<td>119.44</td>
<td>415.19</td>
<td>57.41</td>
<td>119.75</td>
<td>-20.38</td>
<td>-330.01</td>
</tr>
<tr>
<td>Inflation, consumer prices (ann. % growth)</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td>Aid (ann. % growth)</td>
<td>-55.83</td>
<td>46.50</td>
<td>11.63</td>
<td>-16.66</td>
<td>-44.45</td>
<td>62.93</td>
<td>47.19</td>
<td>-38.44</td>
<td>-3.68</td>
<td>14.28</td>
<td>-11.85</td>
<td>..</td>
</tr>
<tr>
<td>FDI (ann. % growth)</td>
<td>69.50</td>
<td>7.28</td>
<td>54.58</td>
<td>-20.87</td>
<td>-43.72</td>
<td>35.75</td>
<td>-1.28</td>
<td>24.19</td>
<td>5.99</td>
<td>3.75</td>
<td>33.09</td>
<td>64.03</td>
</tr>
<tr>
<td>Remittance (ann. % growth)</td>
<td>57.89</td>
<td>33.33</td>
<td>50.00</td>
<td>6.67</td>
<td>4.91</td>
<td>12.15</td>
<td>16.55</td>
<td>18.23</td>
<td>18.68</td>
<td>13.29</td>
<td>6.04</td>
<td>10.61</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Haiti</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDP growth (ann. % growth)</td>
<td>2.71</td>
<td>2.18</td>
<td>2.71</td>
<td>2.87</td>
<td>-1.04</td>
<td>-0.25</td>
<td>0.36</td>
<td>-3.52</td>
<td>1.80</td>
<td>2.32</td>
<td>3.44</td>
<td>1.27</td>
</tr>
<tr>
<td>Money &amp; quasi money (ann. % growth)</td>
<td>20.14</td>
<td>9.24</td>
<td>23.67</td>
<td>20.30</td>
<td>15.40</td>
<td>23.08</td>
<td>38.90</td>
<td>5.43</td>
<td>17.82</td>
<td>5.27</td>
<td>11.13</td>
<td>..</td>
</tr>
<tr>
<td>Unemployment (% of total labour force)</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td>Exports of goods &amp; services (ann. % growth)</td>
<td>14.28</td>
<td>23.28</td>
<td>16.48</td>
<td>6.32</td>
<td>-2.17</td>
<td>-2.08</td>
<td>7.16</td>
<td>9.76</td>
<td>0.03</td>
<td>7.20</td>
<td>-2.92</td>
<td>13.61</td>
</tr>
<tr>
<td>Imports of goods &amp; services (ann. % growth)</td>
<td>7.22</td>
<td>6.60</td>
<td>22.71</td>
<td>29.26</td>
<td>-2.08</td>
<td>-1.17</td>
<td>3.17</td>
<td>-1.06</td>
<td>6.63</td>
<td>1.89</td>
<td>0.46</td>
<td>5.27</td>
</tr>
<tr>
<td>Terms of Trade (2000=100)</td>
<td>107.61</td>
<td>110.31</td>
<td>108.51</td>
<td>100.00</td>
<td>101.20</td>
<td>98.52</td>
<td>96.05</td>
<td>93.12</td>
<td>89.55</td>
<td>98.43</td>
<td>62.42</td>
<td>..</td>
</tr>
<tr>
<td>Current account (millions of $)</td>
<td>-47.70</td>
<td>28.71</td>
<td>-59.82</td>
<td>-114.21</td>
<td>-131.90</td>
<td>-88.95</td>
<td>-44.78</td>
<td>-62.90</td>
<td>7.04</td>
<td>-85.06</td>
<td>-85.79</td>
<td>-289.06</td>
</tr>
<tr>
<td>Capital &amp; financial account (millions of $)</td>
<td>31.56</td>
<td>152.60</td>
<td>58.79</td>
<td>40.87</td>
<td>87.67</td>
<td>48.24</td>
<td>-56.74</td>
<td>-0.18</td>
<td>-41.72</td>
<td>54.01</td>
<td>-40.29</td>
<td>182.57</td>
</tr>
<tr>
<td>Overall balance of payment (millions of $)</td>
<td>-16.14</td>
<td>181.31</td>
<td>-1.03</td>
<td>73.34</td>
<td>-44.23</td>
<td>-40.71</td>
<td>-101.52</td>
<td>-63.08</td>
<td>-34.68</td>
<td>-31.04</td>
<td>-126.07</td>
<td>-106.50</td>
</tr>
<tr>
<td>Aid (ann. % growth)</td>
<td>11.53</td>
<td>-25.23</td>
<td>35.43</td>
<td>20.80</td>
<td>17.99</td>
<td>8.82</td>
<td>-36.71</td>
<td>-21.69</td>
<td>-71.29</td>
<td>-30.88</td>
<td>-20.87</td>
<td>-29.97</td>
</tr>
<tr>
<td>FDI (ann. % growth)</td>
<td>-2.44</td>
<td>169.00</td>
<td>178.81</td>
<td>-55.83</td>
<td>-66.79</td>
<td>29.55</td>
<td>142.11</td>
<td>-57.25</td>
<td>340.68</td>
<td>517.69</td>
<td>-53.61</td>
<td>-60.00</td>
</tr>
<tr>
<td>Remittance (ann. % growth)</td>
<td>68.42</td>
<td>27.85</td>
<td>28.95</td>
<td>36.95</td>
<td>7.89</td>
<td>8.35</td>
<td>20.03</td>
<td>14.86</td>
<td>5.86</td>
<td>7.78</td>
<td>14.98</td>
<td>15.36</td>
</tr>
</tbody>
</table>
Table 2-1 Macroeconomic Indicators (Cont.)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP growth (ann. % growth)</td>
<td>4.36</td>
<td>4.99</td>
<td>3.85</td>
<td>3.61</td>
<td>2.33</td>
<td>3.87</td>
<td>2.53</td>
<td>3.15</td>
<td>3.26</td>
<td>5.38</td>
<td>6.27</td>
<td>4.03</td>
</tr>
<tr>
<td>Money &amp; quasi money (ann. % growth)</td>
<td>25.36</td>
<td>19.48</td>
<td>8.71</td>
<td>21.45</td>
<td>21.73</td>
<td>10.32</td>
<td>50.08</td>
<td>11.48</td>
<td>14.05</td>
<td>12.97</td>
<td>11.85</td>
<td>8.92</td>
</tr>
<tr>
<td>Unemployment (% of total labour force)</td>
<td>...</td>
<td>...</td>
<td>1.7</td>
<td>1.4</td>
<td>1.3</td>
<td>3.1</td>
<td>2.8</td>
<td>3.1</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Cash surplus/deficit (% of GDP)</td>
<td>-0.68</td>
<td>-1.24</td>
<td>-1.64</td>
<td>-1.78</td>
<td>-1.93</td>
<td>-0.96</td>
<td>-2.59</td>
<td>-1.05</td>
<td>-1.72</td>
<td>-1.96</td>
<td>-1.44</td>
<td>-1.59</td>
</tr>
<tr>
<td>Exports of goods &amp; services (ann. % growth)</td>
<td>8.10</td>
<td>2.39</td>
<td>4.60</td>
<td>3.82</td>
<td>3.99</td>
<td>0.71</td>
<td>0.52</td>
<td>8.22</td>
<td>-2.11</td>
<td>4.79</td>
<td>9.42</td>
<td>-0.16</td>
</tr>
<tr>
<td>Imports of goods &amp; services (ann. % growth)</td>
<td>19.50</td>
<td>24.50</td>
<td>0.71</td>
<td>6.04</td>
<td>6.92</td>
<td>1.99</td>
<td>0.54</td>
<td>5.68</td>
<td>-0.57</td>
<td>6.45</td>
<td>7.23</td>
<td>-5.75</td>
</tr>
<tr>
<td>Terms of Trade (2000=100)</td>
<td>112.12</td>
<td>111.34</td>
<td>103.13</td>
<td>100.00</td>
<td>96.75</td>
<td>95.82</td>
<td>93.01</td>
<td>92.10</td>
<td>91.30</td>
<td>89.56</td>
<td>87.90</td>
<td>87.14</td>
</tr>
<tr>
<td>Current account (millions of $)</td>
<td>-63350</td>
<td>-1039.10</td>
<td>-1025.90</td>
<td>-1049.60</td>
<td>-1252.90</td>
<td>-1234.87</td>
<td>-1039.19</td>
<td>-1164.40</td>
<td>-1241.00</td>
<td>-1524.00</td>
<td>-1785.60</td>
<td>-1773.30</td>
</tr>
<tr>
<td>Capital &amp; financial account (millions of $)</td>
<td>592.78</td>
<td>972.26</td>
<td>830.90</td>
<td>963.50</td>
<td>1165.68</td>
<td>1299.54</td>
<td>1099.95</td>
<td>329.38</td>
<td>442.73</td>
<td>1044.22</td>
<td>1379.84</td>
<td>889.54</td>
</tr>
<tr>
<td>Overall balance of payment (millions of $)</td>
<td>-40.72</td>
<td>-66.84</td>
<td>-195.00</td>
<td>-86.10</td>
<td>-87.22</td>
<td>64.67</td>
<td>60.76</td>
<td>-835.02</td>
<td>-798.27</td>
<td>-479.78</td>
<td>-405.76</td>
<td>-883.76</td>
</tr>
<tr>
<td>Inflation, consumer prices (ann. % growth)</td>
<td>9.23</td>
<td>6.97</td>
<td>4.86</td>
<td>5.98</td>
<td>7.63</td>
<td>8.03</td>
<td>5.48</td>
<td>7.39</td>
<td>8.42</td>
<td>6.45</td>
<td>6.45</td>
<td>12.64</td>
</tr>
<tr>
<td>Aid (ann. % growth)</td>
<td>37.47</td>
<td>-11.73</td>
<td>25.60</td>
<td>-10.24</td>
<td>-10.96</td>
<td>6.51</td>
<td>-1.11</td>
<td>-12.02</td>
<td>18.18</td>
<td>88.74</td>
<td>-6.17</td>
<td>17.97</td>
</tr>
<tr>
<td>FDI (ann. % growth)</td>
<td>9.75</td>
<td>697.16</td>
<td>-77.02</td>
<td>48.71</td>
<td>98.14</td>
<td>-75.72</td>
<td>18.43</td>
<td>125.79</td>
<td>71.84</td>
<td>16.37</td>
<td>25.95</td>
<td>12.44</td>
</tr>
<tr>
<td>Remittance (ann. % growth)</td>
<td>8.68</td>
<td>11.89</td>
<td>1.99</td>
<td>28.05</td>
<td>6.30</td>
<td>152.49</td>
<td>34.17</td>
<td>22.38</td>
<td>16.71</td>
<td>20.66</td>
<td>14.49</td>
<td>5.28</td>
</tr>
</tbody>
</table>

**Dominican Rep**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP growth (ann. % growth)</td>
<td>8.00</td>
<td>7.01</td>
<td>6.72</td>
<td>5.66</td>
<td>5.18</td>
<td>5.79</td>
<td>-0.25</td>
<td>1.31</td>
<td>9.26</td>
<td>10.67</td>
<td>8.47</td>
<td>5.26</td>
</tr>
<tr>
<td>Money &amp; quasi money (ann. % growth)</td>
<td>24.12</td>
<td>17.72</td>
<td>21.90</td>
<td>16.80</td>
<td>-19.95</td>
<td>14.79</td>
<td>68.60</td>
<td>9.10</td>
<td>21.96</td>
<td>16.01</td>
<td>22.07</td>
<td>1.32</td>
</tr>
<tr>
<td>Real effective exchange rate (2005=100)</td>
<td>94.49</td>
<td>92.90</td>
<td>91.28</td>
<td>95.68</td>
<td>100.11</td>
<td>94.95</td>
<td>71.40</td>
<td>75.85</td>
<td>100.00</td>
<td>94.84</td>
<td>96.48</td>
<td>97.34</td>
</tr>
<tr>
<td>Unemployment (% of total labour force)</td>
<td>15.6</td>
<td>14.4</td>
<td>13.8</td>
<td>14.2</td>
<td>15.6</td>
<td>16.1</td>
<td>16.7</td>
<td>18.4</td>
<td>11</td>
<td>10</td>
<td>15.6</td>
<td>...</td>
</tr>
<tr>
<td>Cash surplus/deficit (% of GDP)</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>-1.39</td>
<td>-0.50</td>
<td>-0.82</td>
<td>0.30</td>
<td>...</td>
</tr>
<tr>
<td>Exports of goods &amp; services (ann. % growth)</td>
<td>12.95</td>
<td>6.52</td>
<td>5.37</td>
<td>8.74</td>
<td>-6.11</td>
<td>1.98</td>
<td>10.63</td>
<td>3.59</td>
<td>-1.24</td>
<td>0.65</td>
<td>3.22</td>
<td>-4.02</td>
</tr>
<tr>
<td>Imports of goods &amp; services (ann. % growth)</td>
<td>18.62</td>
<td>20.95</td>
<td>1.07</td>
<td>8.49</td>
<td>-4.67</td>
<td>1.53</td>
<td>-12.92</td>
<td>5.26</td>
<td>11.29</td>
<td>8.21</td>
<td>6.82</td>
<td>4.72</td>
</tr>
<tr>
<td>Terms of Trade (2000=100)</td>
<td>100.00</td>
<td>101.01</td>
<td>102.06</td>
<td>100.00</td>
<td>100.95</td>
<td>101.52</td>
<td>97.93</td>
<td>96.72</td>
<td>95.79</td>
<td>94.88</td>
<td>98.05</td>
<td>93.63</td>
</tr>
<tr>
<td>Current account (millions of $)</td>
<td>-163.00</td>
<td>-338.40</td>
<td>-429.20</td>
<td>-1026.50</td>
<td>-740.80</td>
<td>-797.90</td>
<td>1036.18</td>
<td>1041.48</td>
<td>-473.01</td>
<td>-1287.41</td>
<td>-2166.30</td>
<td>-4518.60</td>
</tr>
<tr>
<td>Capital &amp; financial account (millions of $)</td>
<td>356.70</td>
<td>676.98</td>
<td>909.55</td>
<td>1644.96</td>
<td>1192.74</td>
<td>937.21</td>
<td>532.06</td>
<td>60.23</td>
<td>929.32</td>
<td>1410.45</td>
<td>1754.58</td>
<td>4533.19</td>
</tr>
<tr>
<td>Overall balance of payment (millions of $)</td>
<td>193.70</td>
<td>338.58</td>
<td>480.35</td>
<td>618.46</td>
<td>451.94</td>
<td>139.31</td>
<td>1568.24</td>
<td>981.25</td>
<td>456.31</td>
<td>123.04</td>
<td>-411.72</td>
<td>14.59</td>
</tr>
<tr>
<td>Inflation, consumer prices (ann. % growth)</td>
<td>8.30</td>
<td>4.83</td>
<td>6.47</td>
<td>7.72</td>
<td>8.88</td>
<td>5.22</td>
<td>27.45</td>
<td>51.46</td>
<td>4.19</td>
<td>7.57</td>
<td>6.14</td>
<td>10.64</td>
</tr>
<tr>
<td>Aid (ann. % growth)</td>
<td>-28.64</td>
<td>66.50</td>
<td>60.40</td>
<td>-70.47</td>
<td>90.82</td>
<td>35.65</td>
<td>-52.50</td>
<td>22.76</td>
<td>-4.61</td>
<td>-33.28</td>
<td>128.85</td>
<td>23.98</td>
</tr>
<tr>
<td>FDI (ann. % growth)</td>
<td>335.85</td>
<td>66.38</td>
<td>91.17</td>
<td>-28.77</td>
<td>13.24</td>
<td>-15.04</td>
<td>-33.14</td>
<td>48.30</td>
<td>23.50</td>
<td>36.13</td>
<td>3.31</td>
<td>82.70</td>
</tr>
<tr>
<td>Remittance (ann. % growth)</td>
<td>18.65</td>
<td>23.08</td>
<td>16.03</td>
<td>12.73</td>
<td>7.78</td>
<td>10.72</td>
<td>5.97</td>
<td>7.56</td>
<td>8.72</td>
<td>13.43</td>
<td>11.11</td>
<td>3.77</td>
</tr>
</tbody>
</table>
### Table 2-1 Macroeconomic Indicators (Cont.)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Costa Rica</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>GDP growth (ann. % growth)</strong></td>
<td>5.58</td>
<td>8.40</td>
<td>8.22</td>
<td>1.80</td>
<td>1.08</td>
<td>2.90</td>
<td>6.40</td>
<td>4.26</td>
<td>5.89</td>
<td>8.78</td>
<td>7.80</td>
<td>2.61</td>
</tr>
<tr>
<td><strong>Real effective exchange rate (2005=100)</strong></td>
<td>106.71</td>
<td>108.87</td>
<td>106.58</td>
<td>108.80</td>
<td>113.08</td>
<td>110.45</td>
<td>103.19</td>
<td>99.91</td>
<td>100.00</td>
<td>100.88</td>
<td>103.71</td>
<td>109.21</td>
</tr>
<tr>
<td><strong>Unemployment (% of total labour force)</strong></td>
<td>5.7</td>
<td>5.6</td>
<td>5.2</td>
<td>6.1</td>
<td>6.4</td>
<td>6.7</td>
<td>6.5</td>
<td>6.6</td>
<td>4.6</td>
<td>..</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Exports of goods &amp; services (ann. % growth)</strong></td>
<td>8.64</td>
<td>27.13</td>
<td>21.28</td>
<td>-0.33</td>
<td>-9.60</td>
<td>3.64</td>
<td>12.07</td>
<td>8.15</td>
<td>12.79</td>
<td>10.28</td>
<td>10.00</td>
<td>-1.85</td>
</tr>
<tr>
<td><strong>Imports of goods &amp; services (ann. % growth)</strong></td>
<td>14.73</td>
<td>25.25</td>
<td>0.35</td>
<td>-2.61</td>
<td>1.26</td>
<td>6.88</td>
<td>0.85</td>
<td>9.06</td>
<td>12.43</td>
<td>8.09</td>
<td>4.48</td>
<td>4.33</td>
</tr>
<tr>
<td><strong>Terms of Trade (2000=100)</strong></td>
<td>105.66</td>
<td>108.91</td>
<td>107.14</td>
<td>100.00</td>
<td>98.37</td>
<td>96.88</td>
<td>95.46</td>
<td>91.86</td>
<td>88.42</td>
<td>85.75</td>
<td>84.91</td>
<td>81.71</td>
</tr>
<tr>
<td><strong>Current account (millions of $)</strong></td>
<td>-480.88</td>
<td>-520.75</td>
<td>-666.45</td>
<td>-706.77</td>
<td>-602.92</td>
<td>-856.92</td>
<td>-880.05</td>
<td>-795.79</td>
<td>-981.01</td>
<td>-1022.60</td>
<td>-1646.37</td>
<td>-2751.90</td>
</tr>
<tr>
<td><strong>Capital &amp; financial account (millions of $)</strong></td>
<td>323.04</td>
<td>703.28</td>
<td>453.40</td>
<td>315.73</td>
<td>434.57</td>
<td>907.97</td>
<td>844.93</td>
<td>732.08</td>
<td>836.53</td>
<td>873.08</td>
<td>1475.38</td>
<td>2787.49</td>
</tr>
<tr>
<td><strong>Overall balance of payment (millions of $)</strong></td>
<td>-157.83</td>
<td>182.53</td>
<td>-213.05</td>
<td>-391.04</td>
<td>-168.36</td>
<td>51.05</td>
<td>-35.12</td>
<td>-63.71</td>
<td>-144.48</td>
<td>-149.52</td>
<td>-170.99</td>
<td>35.59</td>
</tr>
<tr>
<td><strong>Aid (ann. % growth)</strong></td>
<td>-38.04</td>
<td>-314.9</td>
<td>-157.6</td>
<td>-197.4</td>
<td>-96.25</td>
<td>-197.2</td>
<td>-839.1</td>
<td>-56.03</td>
<td>102.27</td>
<td>22.86</td>
<td>83.38</td>
<td>13.71</td>
</tr>
<tr>
<td><strong>FDI (ann. % growth)</strong></td>
<td>-4.40</td>
<td>50.20</td>
<td>1.04</td>
<td>-34.05</td>
<td>12.68</td>
<td>43.22</td>
<td>-12.78</td>
<td>38.04</td>
<td>8.47</td>
<td>70.62</td>
<td>29.07</td>
<td>6.59</td>
</tr>
<tr>
<td><strong>Remittance (ann. % growth)</strong></td>
<td>-0.51</td>
<td>-1.54</td>
<td>-1.26</td>
<td>7.51</td>
<td>45.94</td>
<td>26.31</td>
<td>28.02</td>
<td>-0.42</td>
<td>31.54</td>
<td>22.08</td>
<td>20.42</td>
<td>-2.13</td>
</tr>
</tbody>
</table>

Source: World Development Indicators (World Bank, December 2010), IMF Balance of Payment statistics (January 2011)

Notes: Data on some variables for some countries during 1997-2008 are non-existent.
Table 2-2 LAMP Data (Number of Communities and Household Interviewed)

<table>
<thead>
<tr>
<th></th>
<th>Costa Rica (LAMP-CR7)</th>
<th>Dominican Rep (LAMP-DR7)</th>
<th>Guatemala (LAMP-GUA3)</th>
<th>Haiti (LAMP-HA3)</th>
<th>Nicaragua (LAMP-NIC9)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Data Gathered</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>–December 2002</td>
</tr>
<tr>
<td>1.</td>
<td>Communities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4: 198 HH in CR, 2 in US</td>
<td>4: 99 HH in DR, 9 in US</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5: 200 HH in CR</td>
<td>5: 147 HH in DR, 16 in US</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6: 201 HH in CR</td>
<td>6: 149 HH in DR, 5 in US</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7: 197 HH in CR</td>
<td>7: 151 HH in DR, 15 in US</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>No. of Households Interviewed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i.</td>
<td>Country of origin</td>
<td>1391</td>
<td>904</td>
<td>523</td>
<td>309</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Country of destination (USA)</td>
<td>37</td>
<td>79</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td>i.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Population in sample</td>
<td>7414</td>
<td>5913</td>
<td>2813</td>
<td>1675</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Male (%) in sample</td>
<td>49.4</td>
<td>46.6</td>
<td>48.5</td>
<td>48.2</td>
</tr>
</tbody>
</table>

Source: Calculated using LAMP survey data and using http://lamp.opr.princeton.edu

Notes: Column 2 demonstrates that Costa Rican Household data, LAMP-CR7, was collected during April 2000-Nov 2002. There were 7 Costa Rican communities in the sample (for confidentiality reasons, LAMP withheld the community names). From community 1, 199 households were interviewed in Costa Rica and 18 households were interviewed in the US. In total LAMP-CR7 covered 1391 households comprising 7414 members.
### Table 2-3 Microeconomic Indicators (Remittance Sender)

<table>
<thead>
<tr>
<th></th>
<th>Costa Rica</th>
<th>Dominican Rep</th>
<th>Guatemala</th>
<th>Haiti</th>
<th>Nicaragua</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No. of Migrants Interviewed</td>
<td>537</td>
<td>924</td>
<td>256</td>
<td>193</td>
<td>625</td>
</tr>
<tr>
<td>2. Male (%)</td>
<td>68.24</td>
<td>40.2</td>
<td>69.5</td>
<td>59.5</td>
<td>54.4</td>
</tr>
<tr>
<td>3. Mean Education (yrs)</td>
<td>8.6</td>
<td>10.4</td>
<td>7.9</td>
<td>..</td>
<td>10.7</td>
</tr>
<tr>
<td>4. Mean Age of Migration</td>
<td>25.4</td>
<td>24.7</td>
<td>25.4</td>
<td>24.2</td>
<td>26.4</td>
</tr>
<tr>
<td>5. Mean Duration of First Trip (months)</td>
<td>60.5</td>
<td>135.6</td>
<td>84.0</td>
<td>129.1</td>
<td>117.3</td>
</tr>
<tr>
<td>6. Mean no. of Trip</td>
<td>1.5</td>
<td>1.2</td>
<td>1.8</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>7. Married (%)</td>
<td>41.3</td>
<td>30.3</td>
<td>41.8</td>
<td>35.8</td>
<td>45.3</td>
</tr>
<tr>
<td>8. Remitting (%)</td>
<td>67.47</td>
<td>66.45</td>
<td>77.21</td>
<td>75.42</td>
<td>61.56</td>
</tr>
<tr>
<td>9. Remitting Purpose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Consumption</td>
<td>82.40</td>
<td>67.65</td>
<td>96.61</td>
<td>78.57</td>
<td>81.93</td>
</tr>
<tr>
<td>b) Asset Accumulation</td>
<td>17.60</td>
<td>32.35</td>
<td>3.39</td>
<td>21.43</td>
<td>18.07</td>
</tr>
<tr>
<td>c) Average Monthly Remittances ($)</td>
<td>350.78</td>
<td>127.63</td>
<td>181.74</td>
<td>119.45</td>
<td>161.50</td>
</tr>
</tbody>
</table>

Source: Calculated using LAMP survey data and using [http://lamp.opr.princeton.edu](http://lamp.opr.princeton.edu)

Notes: Column-2 demonstrates that Costa Rican migrants are mostly male, the percentage of male is 84.85. They have got a mean schooling of 8.23 years. At their first trip to the United States, the mean age of migrants was 30.07 years and the mean duration of that trip was 3.51 years. At their first trip on average 56.37% were married. Among the Costa Rican migrants, about 67.47% remits money back home; each month on average they send about $350.78. The main remitting purpose is consumption (82.40%) and asset accumulation (17.60%).
Table 2-4 Microeconomic Indicators (Remittance Receiver)

<table>
<thead>
<tr>
<th>Remittances</th>
<th>Costa Rica Receiver</th>
<th>Costa Rica Non-receiver</th>
<th>Dominican Rep Receiver</th>
<th>Dominican Rep Non-receiver</th>
<th>Guatemala Receiver</th>
<th>Guatemala Non-receiver</th>
<th>Haiti Receiver</th>
<th>Haiti Non-receiver</th>
<th>Nicaragua Receiver</th>
<th>Nicaragua Non-receiver</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Households</td>
<td>8.02</td>
<td>91.98</td>
<td>24.38</td>
<td>75.62</td>
<td>17.74</td>
<td>82.26</td>
<td>58.16</td>
<td>41.84</td>
<td>15.86</td>
<td>84.14</td>
</tr>
<tr>
<td>2. Size of Remittances (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Small</td>
<td>42.99</td>
<td>-</td>
<td>49.31</td>
<td>-</td>
<td>26.14</td>
<td>-</td>
<td>39.18</td>
<td>-</td>
<td>58.73</td>
<td>-</td>
</tr>
<tr>
<td>b) Intermediate</td>
<td>25.23</td>
<td>-</td>
<td>22.12</td>
<td>-</td>
<td>10.23</td>
<td>-</td>
<td>28.07</td>
<td>-</td>
<td>11.11</td>
<td>-</td>
</tr>
<tr>
<td>c) Substantial</td>
<td>31.78</td>
<td>-</td>
<td>28.57</td>
<td>-</td>
<td>63.64</td>
<td>-</td>
<td>32.75</td>
<td>-</td>
<td>30.16</td>
<td>-</td>
</tr>
<tr>
<td>3. Age Range (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) age &lt;=35</td>
<td>16.22</td>
<td>20.82</td>
<td>24.42</td>
<td>25.26</td>
<td>13.19</td>
<td>21.33</td>
<td>17.54</td>
<td>17.89</td>
<td>15.02</td>
<td>19.52</td>
</tr>
<tr>
<td>b) 35&lt; age &lt;=55</td>
<td>45.95</td>
<td>51.06</td>
<td>35.02</td>
<td>47.40</td>
<td>49.45</td>
<td>54.74</td>
<td>48.54</td>
<td>54.47</td>
<td>40.32</td>
<td>50.75</td>
</tr>
<tr>
<td>c) age &gt; 55</td>
<td>37.84</td>
<td>28.12</td>
<td>40.55</td>
<td>27.34</td>
<td>37.36</td>
<td>23.93</td>
<td>33.92</td>
<td>27.64</td>
<td>44.66</td>
<td>29.73</td>
</tr>
<tr>
<td>4. Male (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Marital Status (%)</td>
<td>81.98</td>
<td>78.46</td>
<td>66.82</td>
<td>80.30</td>
<td>76.92</td>
<td>89.81</td>
<td>74.55</td>
<td>63.48</td>
<td>74.70</td>
<td>84.05</td>
</tr>
<tr>
<td>6. Education (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Primary</td>
<td>27.93</td>
<td>18.30</td>
<td>32.26</td>
<td>31.50</td>
<td>46.15</td>
<td>38.15</td>
<td>2.92</td>
<td>12.20</td>
<td>33.99</td>
<td>36.07</td>
</tr>
<tr>
<td>b) Secondary</td>
<td>63.06</td>
<td>61.43</td>
<td>50.69</td>
<td>45.32</td>
<td>51.65</td>
<td>51.66</td>
<td>65.50</td>
<td>52.85</td>
<td>51.78</td>
<td>47.99</td>
</tr>
<tr>
<td>c) Tertiary</td>
<td>9.01</td>
<td>20.27</td>
<td>17.05</td>
<td>23.18</td>
<td>2.20</td>
<td>8.77</td>
<td>31.58</td>
<td>34.96</td>
<td>14.23</td>
<td>15.95</td>
</tr>
<tr>
<td>7. Employment Status (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Not in Labour Force</td>
<td>27.93</td>
<td>18.70</td>
<td>33.80</td>
<td>16.82</td>
<td>18.39</td>
<td>4.53</td>
<td>10.37</td>
<td>12.50</td>
<td>27.49</td>
<td>14.90</td>
</tr>
<tr>
<td>b) Unemployed</td>
<td>0.90</td>
<td>1.18</td>
<td>7.87</td>
<td>4.76</td>
<td>1.15</td>
<td>0.48</td>
<td>0.61</td>
<td>1.67</td>
<td>3.98</td>
<td>5.66</td>
</tr>
<tr>
<td>c) Employed</td>
<td>71.17</td>
<td>78.90</td>
<td>58.33</td>
<td>78.42</td>
<td>80.46</td>
<td>94.99</td>
<td>89.02</td>
<td>85.83</td>
<td>68.53</td>
<td>79.43</td>
</tr>
<tr>
<td>8. Land Financed by Remittances (%)</td>
<td>10.13</td>
<td>-</td>
<td>2.70</td>
<td>-</td>
<td>2.75</td>
<td>-</td>
<td>4.71</td>
<td>-</td>
<td>4.27</td>
<td>-</td>
</tr>
</tbody>
</table>
Table 2-4 Microeconomic Indicators (Remittance Receiver) (Cont.)

<table>
<thead>
<tr>
<th>Remittances</th>
<th>Costa Rica</th>
<th>Dominican Rep</th>
<th>Guatemala</th>
<th>Haiti</th>
<th>Nicaragua</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Receiver</td>
<td>Non-receiver</td>
<td>Receiver</td>
<td>Non-receiver</td>
<td>Receiver</td>
</tr>
<tr>
<td>9. Home Financed by Remittances (%)</td>
<td>6.28</td>
<td>-</td>
<td>9.15</td>
<td>-</td>
<td>6.65</td>
</tr>
<tr>
<td>10. Vehicle Financed by Remittances (%)</td>
<td>7.47</td>
<td>11.69</td>
<td>14.67</td>
<td>43.10</td>
<td>5.30</td>
</tr>
<tr>
<td>11. HH business ownership (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Entrepreneur</td>
<td>32.43</td>
<td>37.50</td>
<td>22.58</td>
<td>30.51</td>
<td>53.85</td>
</tr>
<tr>
<td>b) Other</td>
<td>37.50</td>
<td>62.50</td>
<td>77.42</td>
<td>69.49</td>
<td>46.15</td>
</tr>
</tbody>
</table>

Source: Calculated using LAMP Survey Data.

Notes: Column 2 and 3 of Table 2-4 demonstrates that in Costa Rica, only 8.02% households reported to realize an increase in nominal income from remittance flow; 91.98% does not receive any remittance transfer. According to the respondents, in Costa Rica, for 42.99% of the remittance-receiving households, these transfers constitute a small portion of their income; it is intermediate for 25.23% and substantial for 31.78% of the remittance-receiving households. In Costa Rica, among the remittance receiving households (non-receiving households), 16.22% (20.82%) of the household heads belongs to the age group <=35, 45.95% (51.06%) belongs to the age group 35<age<=55, and 37.84% (28.12%) belongs to the age group >55. While looking at the gender ratio, 68.47% (79.10%) of Costa Rican remittance receivers (non-receivers) are male. According to the marital status, 81.98% (78.46%) of Costa Rican remittance receivers (non-receivers) are married. In Costa Rica among the remittance receiving households (non-receiving households), 27.93% (18.30%) complete the primary level, whereas 9.01% (20.27%) complete the tertiary level. Among the remittance receiving households (non-receiving households), 71.17% (78.90%) of Costa Rican household heads are employed and 0.90% (1.18%) are unemployed. According to the reported usage of remittances, 10.13% Costa Rican (current) landowners purchased land with remittances, 6.28% (current) home owners purchased house of residence with the transferred fund, and 7.47% vehicle owners financed their vehicles with remittances. Most importantly, in Costa Rica, those who are receiving (not receiving) remittances, among them, 47.43% and 62.57%, respectively, are doing business. Those who are not receiving remittances, among them, only 32.43% (37.50%) are doing business.
<table>
<thead>
<tr>
<th>Businessholding</th>
<th>Nicaragua</th>
<th>Haiti</th>
<th>Guatemala</th>
<th>Costa Rica</th>
<th>Dominican Republic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No of obs = 1586</td>
<td>No of obs = 245</td>
<td>Number of obs = 500</td>
<td>Number of obs = 1364</td>
<td>No of obs = 781</td>
</tr>
<tr>
<td></td>
<td>Wald chi2(29)= 421.31</td>
<td>Wald chi2(17) = 82.90</td>
<td>Wald chi2(15) = 120.36</td>
<td>Wald chi2(25)= 297.80</td>
<td>Wald chi2(25) = 184.22</td>
</tr>
<tr>
<td></td>
<td>Log likelihood = -1374.89</td>
<td>Log likelihood = -278.55</td>
<td>Log likelihood = -512.26</td>
<td>Log likelihood = -1107.11</td>
<td>Log likelihood = -786.03</td>
</tr>
<tr>
<td></td>
<td>Prob &gt; chi2 = 0.00</td>
<td>Prob &gt; chi2 = 0.00</td>
<td>Prob &gt; chi2 = 0.00</td>
<td>Prob &gt; chi2 = 0.00</td>
<td>Prob &gt; chi2 = 0.00</td>
</tr>
<tr>
<td>Remreceive</td>
<td>0.28 (0.19)</td>
<td>-0.04</td>
<td>0.52 (0.43)</td>
<td>1.20 (0.35)</td>
<td>0.44 (0.69)</td>
</tr>
<tr>
<td>Hage</td>
<td>0.09*** (0.01)</td>
<td>0.07 (0.04)</td>
<td>0.05*** (0.02)</td>
<td>2.12</td>
<td>0.05*** (0.02)</td>
</tr>
<tr>
<td>Agesquared</td>
<td>-0.00*** (0.00)</td>
<td>-0.00 (0.00)</td>
<td>-0.00*** (0.00)</td>
<td>-2.09</td>
<td>-0.00*** (0.00)</td>
</tr>
<tr>
<td>Hsex</td>
<td>0.09 (0.09)</td>
<td>1.01 (0.21)</td>
<td>0.37* (0.19)</td>
<td>1.74 (0.12)</td>
<td>0.25 (0.28)</td>
</tr>
<tr>
<td>Maritalstatus</td>
<td>0.18* (0.10)</td>
<td>1.79 (0.23)</td>
<td>-0.17 (0.28)</td>
<td>-0.74 (0.12)</td>
<td>0.21 (0.28)</td>
</tr>
<tr>
<td>Heducation</td>
<td>0.00 (0.01)</td>
<td>0.26 (0.02)</td>
<td>-0.04* (0.01)</td>
<td>-1.89 (0.01)</td>
<td>0.01 (0.01)</td>
</tr>
<tr>
<td>Nonworkers</td>
<td>-0.93*** (0.14)</td>
<td>-6.56 (0.33)</td>
<td>-0.99*** (0.28)</td>
<td>-2.99</td>
<td>-0.52* (0.28)</td>
</tr>
<tr>
<td>Pastlandholding</td>
<td>0.50** (0.25)</td>
<td>2.00 (0.61)</td>
<td>0.00 (0.69)</td>
<td>0.01 (0.15)</td>
<td>-0.77 (0.15)</td>
</tr>
<tr>
<td>Uspastexperience</td>
<td>0.27*** (0.09)</td>
<td>2.94 (0.24)</td>
<td>-0.16 (0.15)</td>
<td>-0.66 (0.07)</td>
<td>0.52*** (0.15)</td>
</tr>
<tr>
<td>-----------------</td>
<td>----------------</td>
<td>---</td>
<td>-------------</td>
<td>---</td>
<td>-----------------</td>
</tr>
<tr>
<td>Community2</td>
<td>-0.41***</td>
<td>-2.81</td>
<td>0.06</td>
<td>0.19</td>
<td>0.14</td>
</tr>
<tr>
<td>Community3</td>
<td>0.52***</td>
<td>3.95</td>
<td>-0.60*</td>
<td>-2.51</td>
<td>-0.28***</td>
</tr>
<tr>
<td>Community4</td>
<td>0.54***</td>
<td>4.02</td>
<td></td>
<td></td>
<td>1.25***</td>
</tr>
<tr>
<td>Community5</td>
<td>0.62***</td>
<td>4.68</td>
<td></td>
<td></td>
<td>0.78***</td>
</tr>
<tr>
<td>Community6</td>
<td>0.54***</td>
<td>3.16</td>
<td></td>
<td></td>
<td>0.82***</td>
</tr>
<tr>
<td>Community7</td>
<td>0.30*</td>
<td>1.80</td>
<td></td>
<td></td>
<td>0.76***</td>
</tr>
<tr>
<td>Community8</td>
<td>0.68***</td>
<td>5.02</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community9</td>
<td>0.45***</td>
<td>3.27</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-2.46***</td>
<td>-6.20</td>
<td>1.02</td>
<td>0.90</td>
<td>-1.32*</td>
</tr>
<tr>
<td></td>
<td>Nicaragua</td>
<td>Haiti</td>
<td>Guatemala</td>
<td>Costa Rica</td>
<td>Dominican Republic</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------</td>
<td>-------</td>
<td>-----------</td>
<td>------------</td>
<td>-------------------</td>
</tr>
<tr>
<td><strong>RemreceiveUS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Uscurrenttrip</strong></td>
<td>4.40***</td>
<td>13.55</td>
<td>1.84*</td>
<td>3.85</td>
<td>1.15***</td>
</tr>
<tr>
<td></td>
<td>(0.32)</td>
<td>(0.48)</td>
<td>(0.15)</td>
<td>(0.15)</td>
<td>(0.14)</td>
</tr>
<tr>
<td><strong>Nonworkers</strong></td>
<td>0.17</td>
<td>0.75</td>
<td>-0.32</td>
<td>-0.85</td>
<td>0.41</td>
</tr>
<tr>
<td></td>
<td>(0.22)</td>
<td>(0.38)</td>
<td>(0.34)</td>
<td>(0.26)</td>
<td>(0.26)</td>
</tr>
<tr>
<td><strong>Employmentstatus</strong></td>
<td>-0.28***</td>
<td>-2.25</td>
<td>0.10</td>
<td>0.29</td>
<td>-0.59***</td>
</tr>
<tr>
<td></td>
<td>(0.13)</td>
<td>(0.37)</td>
<td>(0.28)</td>
<td>(0.16)</td>
<td>(0.14)</td>
</tr>
<tr>
<td><strong>Curlandholding</strong></td>
<td>0.40</td>
<td>2.6</td>
<td>0.91*</td>
<td>4.23</td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td>(0.16)</td>
<td>(0.22)</td>
<td>(0.17)</td>
<td>(0.17)</td>
<td>(0.17)</td>
</tr>
<tr>
<td><strong>Community2</strong></td>
<td>-0.48****</td>
<td>-2.32</td>
<td>1.04*</td>
<td>4.19</td>
<td>0.31*</td>
</tr>
<tr>
<td></td>
<td>(0.21)</td>
<td>(0.25)</td>
<td>(0.18)</td>
<td>(0.24)</td>
<td>(0.24)</td>
</tr>
<tr>
<td><strong>Community3</strong></td>
<td>-0.02</td>
<td>-0.09</td>
<td>0.14</td>
<td>0.60</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td>(0.17)</td>
<td>(0.23)</td>
<td>(0.19)</td>
<td>(0.27)</td>
<td>(0.27)</td>
</tr>
<tr>
<td><strong>Community4</strong></td>
<td>-1.02***</td>
<td>-3.7</td>
<td>-</td>
<td>-</td>
<td>-0.91***</td>
</tr>
<tr>
<td></td>
<td>(0.27)</td>
<td>(0.27)</td>
<td>(0.27)</td>
<td>(0.27)</td>
<td>(0.27)</td>
</tr>
<tr>
<td><strong>Community5</strong></td>
<td>-0.50***</td>
<td>-2.43</td>
<td></td>
<td>-</td>
<td>0.20</td>
</tr>
<tr>
<td></td>
<td>(0.21)</td>
<td>(0.17)</td>
<td>(0.17)</td>
<td>(0.17)</td>
<td>(0.17)</td>
</tr>
<tr>
<td><strong>Community6</strong></td>
<td>0.13</td>
<td>0.65</td>
<td>-0.49***</td>
<td>-2.20</td>
<td>0.20</td>
</tr>
<tr>
<td></td>
<td>(0.21)</td>
<td>(0.22)</td>
<td>(0.22)</td>
<td>(0.17)</td>
<td>(0.17)</td>
</tr>
<tr>
<td><strong>Community7</strong></td>
<td>-0.29</td>
<td>-1.22</td>
<td>-0.19</td>
<td>-0.98</td>
<td>-1.13</td>
</tr>
<tr>
<td></td>
<td>(0.24)</td>
<td>(0.19)</td>
<td>(0.19)</td>
<td>(0.20)***</td>
<td>(0.20)***</td>
</tr>
</tbody>
</table>
Table 2-5 Recursive Simultaneous Bivariate Probit (cont.)

<table>
<thead>
<tr>
<th>RemreceiveUS</th>
<th>Nicaragua</th>
<th>Haiti</th>
<th>Guatemala</th>
<th>Costa Rica</th>
<th>Dominican Republic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coef.</td>
<td>Z</td>
<td>Coef. z</td>
<td>Coef. z</td>
<td>Coef. z</td>
<td>Coef. z</td>
</tr>
<tr>
<td>Community8</td>
<td>-0.03</td>
<td>-0.15</td>
<td>(0.18)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community9</td>
<td>0.00</td>
<td>-0.02</td>
<td>(0.18)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-1.26</td>
<td>-5.25</td>
<td>-0.51</td>
<td>-1.07</td>
<td>-1.04***</td>
</tr>
<tr>
<td></td>
<td>(0.24)</td>
<td>(0.48)</td>
<td>(0.39)</td>
<td>(0.31)</td>
<td>(0.39)</td>
</tr>
<tr>
<td>Rho</td>
<td>-0.06</td>
<td>0.19</td>
<td>-0.37</td>
<td>-0.16</td>
<td>0.14</td>
</tr>
<tr>
<td></td>
<td>(0.12)</td>
<td>(0.33)</td>
<td>(-0.27)</td>
<td>(0.19)</td>
<td>(0.42)</td>
</tr>
</tbody>
</table>

Likelihood-ratio test of \( \rho = 0 \)

<table>
<thead>
<tr>
<th></th>
<th>chi2(1) = 0.27</th>
<th>chi2(1) = 0.34</th>
<th>chi2(4) = 1.94</th>
<th>chi2(1) = 0.64</th>
<th>chi2(1) = 0.10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prob &gt; chi2</td>
<td>0.60</td>
<td>0.56</td>
<td>0.16</td>
<td>0.42</td>
<td>0.75</td>
</tr>
</tbody>
</table>

Source: Calculated using LAMP Survey Data.

Notes: *** , ** and * Signify statistically different from zero at the 1%, 5% and 10% level, respectively.
Table 2-6: Probit Regression

<table>
<thead>
<tr>
<th></th>
<th>Nicaragua</th>
<th>Haiti</th>
<th>Guatemala</th>
<th>Costa Rica</th>
<th>Dominican Republic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No of obs = 1590</td>
<td>No of obs = 254</td>
<td>Number of obs = 509</td>
<td>Number of obs = 1372</td>
<td>No of obs = 785</td>
</tr>
<tr>
<td>LR chi2(10)</td>
<td>214.82</td>
<td>30.63</td>
<td>43.02</td>
<td>175.89</td>
<td>117.82</td>
</tr>
<tr>
<td>Prob &gt; chi2</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00000</td>
<td>0.00</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>-984.02</td>
<td>-157.25</td>
<td>-335.65</td>
<td>-818.43</td>
<td>-409.55</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Businessholding</th>
<th>Coef.</th>
<th>z</th>
<th>dF/dx</th>
<th>Coef.</th>
<th>z</th>
<th>dF/dx</th>
<th>Coef.</th>
<th>z</th>
<th>dF/dx</th>
<th>Coef.</th>
<th>z</th>
<th>dF/dx</th>
<th>Coef.</th>
<th>z</th>
<th>dF/dx</th>
<th>Var. Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remreceive</td>
<td>0.17*</td>
<td>1.64</td>
<td>0.07</td>
<td>0.25</td>
<td>1.44</td>
<td>0.10</td>
<td>-0.04</td>
<td>-0.24</td>
<td>-0.01</td>
<td>0.18</td>
<td>1.25</td>
<td>0.07</td>
<td>-0.40***</td>
<td>-2.98</td>
<td>-0.12</td>
<td>Binary</td>
</tr>
<tr>
<td></td>
<td>(0.10)</td>
<td></td>
<td>(0.18)</td>
<td>(0.16)</td>
<td></td>
<td>(0.14)</td>
<td>(0.14)</td>
<td></td>
<td></td>
<td>(0.10)</td>
<td></td>
<td></td>
<td>(0.14)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hage</td>
<td>0.09***</td>
<td>6.05</td>
<td>0.03</td>
<td>0.03</td>
<td>0.73</td>
<td>0.01</td>
<td>0.05***</td>
<td>2.19</td>
<td>0.02</td>
<td>0.05***</td>
<td>3.21</td>
<td>0.02</td>
<td>0.06***</td>
<td>2.49</td>
<td>0.02</td>
<td>Continuous</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td></td>
<td>(0.04)</td>
<td>(0.02)</td>
<td></td>
<td>(0.02)</td>
<td>(0.02)</td>
<td></td>
<td></td>
<td>(0.01)</td>
<td></td>
<td></td>
<td>(0.02)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agesquared</td>
<td>0.00***</td>
<td>-5.64</td>
<td>0.00</td>
<td>0.00</td>
<td>-1.09</td>
<td>0.00</td>
<td>0.00**</td>
<td>-2.06</td>
<td>0.00</td>
<td>0.00***</td>
<td>-3.36</td>
<td>0.00</td>
<td>0.00***</td>
<td>-2.48</td>
<td>0.00</td>
<td>Continuous</td>
</tr>
<tr>
<td></td>
<td>(0.00)</td>
<td></td>
<td>(0.00)</td>
<td>(0.00)</td>
<td></td>
<td>(0.00)</td>
<td>(0.00)</td>
<td></td>
<td></td>
<td>(0.00)</td>
<td></td>
<td></td>
<td>(0.00)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hsex</td>
<td>0.08</td>
<td>0.88</td>
<td>0.03</td>
<td>0.38*</td>
<td>1.81</td>
<td>0.15</td>
<td>0.22</td>
<td>1.16</td>
<td>0.09</td>
<td>0.20*</td>
<td>1.72</td>
<td>0.07</td>
<td>0.50***</td>
<td>3.24</td>
<td>0.15</td>
<td>Binary</td>
</tr>
<tr>
<td></td>
<td>(0.09)</td>
<td></td>
<td>(0.21)</td>
<td>(0.19)</td>
<td></td>
<td>(0.12)</td>
<td>(0.15)</td>
<td></td>
<td></td>
<td>(0.09)</td>
<td></td>
<td></td>
<td>(0.15)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maritalstatus</td>
<td>0.20*</td>
<td>1.95</td>
<td>0.08</td>
<td>-0.22</td>
<td>-0.95</td>
<td>-0.08</td>
<td>0.15</td>
<td>0.51</td>
<td>0.06</td>
<td>0.36***</td>
<td>3.11</td>
<td>0.13</td>
<td>0.26*</td>
<td>1.73</td>
<td>0.08</td>
<td>Binary</td>
</tr>
<tr>
<td></td>
<td>(0.10)</td>
<td></td>
<td>(0.23)</td>
<td>(0.29)</td>
<td></td>
<td>(0.12)</td>
<td>(0.15)</td>
<td></td>
<td></td>
<td>(0.10)</td>
<td></td>
<td></td>
<td>(0.15)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heducation</td>
<td>0.00</td>
<td>0.32</td>
<td>0.00</td>
<td>-0.04**</td>
<td>-2.11</td>
<td>-0.02</td>
<td>0.01</td>
<td>1.09</td>
<td>0.01</td>
<td>0.02*</td>
<td>1.66</td>
<td>0.01</td>
<td>0.02</td>
<td>1.34</td>
<td>0.01</td>
<td>Continuous</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td></td>
<td>(0.02)</td>
<td>(0.01)</td>
<td></td>
<td>(0.01)</td>
<td>(0.01)</td>
<td></td>
<td></td>
<td>(0.01)</td>
<td></td>
<td></td>
<td>(0.01)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonworkers</td>
<td>-0.93***</td>
<td>-6.52</td>
<td>-0.36</td>
<td>-0.87***</td>
<td>-2.69</td>
<td>-0.34</td>
<td>-0.52***</td>
<td>-1.90</td>
<td>-0.21</td>
<td>-0.26*</td>
<td>-1.75</td>
<td>-0.10</td>
<td>-0.37*</td>
<td>-1.83</td>
<td>-0.12</td>
<td>Continuous</td>
</tr>
<tr>
<td></td>
<td>(0.14)</td>
<td></td>
<td>(0.32)</td>
<td>(0.27)</td>
<td></td>
<td>(0.15)</td>
<td>(0.20)</td>
<td></td>
<td></td>
<td>(0.14)</td>
<td></td>
<td></td>
<td>(0.20)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pastlandholding</td>
<td>0.49***</td>
<td>1.98</td>
<td>0.19</td>
<td>0.02</td>
<td>0.03</td>
<td>0.01</td>
<td>-0.78</td>
<td>-1.11</td>
<td>-0.29</td>
<td>0.66***</td>
<td>4.28</td>
<td>0.26</td>
<td>0.78***</td>
<td>2.26</td>
<td>0.29</td>
<td>Binary</td>
</tr>
<tr>
<td></td>
<td>(0.25)</td>
<td></td>
<td>(0.61)</td>
<td>(0.71)</td>
<td></td>
<td>(0.15)</td>
<td>(0.34)</td>
<td></td>
<td></td>
<td>(0.25)</td>
<td></td>
<td></td>
<td>(0.34)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uspastexperience</td>
<td>0.28***</td>
<td>3.00</td>
<td>0.11</td>
<td>-0.17</td>
<td>-0.73</td>
<td>-0.07</td>
<td>0.54***</td>
<td>3.53</td>
<td>0.21</td>
<td>0.18***</td>
<td>2.52</td>
<td>0.07</td>
<td>0.56***</td>
<td>4.85</td>
<td>0.18</td>
<td>Continuous</td>
</tr>
<tr>
<td></td>
<td>(0.09)</td>
<td></td>
<td>(0.24)</td>
<td>(0.15)</td>
<td></td>
<td>(0.07)</td>
<td>(0.11)</td>
<td></td>
<td></td>
<td>(0.09)</td>
<td></td>
<td></td>
<td>(0.11)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Businessholding</td>
<td>Nicaragua</td>
<td>Haiti</td>
<td>Guatemala</td>
<td>Costa Rica</td>
<td>Dominican Republic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------</td>
<td>-------</td>
<td>-----------</td>
<td>------------</td>
<td>-------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coef.</td>
<td>z</td>
<td>dF/dx</td>
<td>Coef.</td>
<td>z</td>
<td>dF/dx</td>
<td>Coef.</td>
<td>z</td>
<td>dF/dx</td>
<td>Coef.</td>
<td>z</td>
<td>dF/dx</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community2</td>
<td>-0.41***</td>
<td>-2.83</td>
<td>-0.13</td>
<td>-0.05</td>
<td>-0.02</td>
<td>1.37</td>
<td>0.08</td>
<td>1.02***</td>
<td>6.58</td>
<td>0.31</td>
<td>0.19</td>
<td>0.96</td>
<td>0.06</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.14)</td>
<td></td>
<td></td>
<td>(0.25)</td>
<td></td>
<td>(0.14)</td>
<td></td>
<td>(0.16)</td>
<td></td>
<td>(0.20)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community3</td>
<td>0.53***</td>
<td>4.01</td>
<td>0.20</td>
<td>-0.65**</td>
<td>-2.93</td>
<td>-0.26**</td>
<td>-1.89</td>
<td>-0.10</td>
<td>1.36***</td>
<td>8.57</td>
<td>0.45</td>
<td>0.34*</td>
<td>1.66</td>
<td>0.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.13)</td>
<td></td>
<td></td>
<td>(0.22)</td>
<td></td>
<td>(0.14)</td>
<td></td>
<td>(0.16)</td>
<td></td>
<td>(0.21)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community4</td>
<td>0.53***</td>
<td>3.96</td>
<td>0.20</td>
<td></td>
<td></td>
<td></td>
<td>1.22***</td>
<td>7.39</td>
<td>0.38</td>
<td>0.12</td>
<td>0.59</td>
<td>0.04</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.13)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.16)</td>
<td></td>
<td></td>
<td>(0.21)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community5</td>
<td>0.61***</td>
<td>4.63</td>
<td>0.24</td>
<td></td>
<td></td>
<td></td>
<td>0.78***</td>
<td>5.17</td>
<td>0.22</td>
<td>-0.09</td>
<td>-0.45</td>
<td>-0.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.13)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.15)</td>
<td></td>
<td></td>
<td>(0.19)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community6</td>
<td>0.53***</td>
<td>3.14</td>
<td>0.20</td>
<td></td>
<td></td>
<td></td>
<td>0.78***</td>
<td>4.53</td>
<td>0.22</td>
<td>0.34*</td>
<td>1.84</td>
<td>0.12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.17)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.17)</td>
<td></td>
<td></td>
<td>(0.18)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community7</td>
<td>0.28***</td>
<td>1.69</td>
<td>0.10</td>
<td></td>
<td></td>
<td></td>
<td>0.75***</td>
<td>4.73</td>
<td>0.20</td>
<td>-0.30</td>
<td>-1.57</td>
<td>-0.09</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.17)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.16)</td>
<td></td>
<td></td>
<td>(0.19)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community8</td>
<td>0.66***</td>
<td>4.92</td>
<td>0.26</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.13)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community9</td>
<td>0.44***</td>
<td>3.22</td>
<td>0.17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.14)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-2.46***</td>
<td>-6.23</td>
<td></td>
<td>0.73</td>
<td>0.65</td>
<td>-1.27**</td>
<td>-1.86</td>
<td>-2.83***</td>
<td>-6.72</td>
<td>-2.44***</td>
<td>-4.15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.40)</td>
<td></td>
<td></td>
<td>(1.12)</td>
<td></td>
<td>(0.69)</td>
<td></td>
<td>(0.42)</td>
<td></td>
<td>(0.59)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total effect of age</td>
<td>0.02***</td>
<td>6.26</td>
<td>0.00</td>
<td>0.41</td>
<td>0.01</td>
<td>2.23</td>
<td>0.01</td>
<td>3.00</td>
<td>0.01</td>
<td>2.43</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td></td>
<td></td>
<td>(0.008)</td>
<td></td>
<td>(.004)</td>
<td></td>
<td>(.003)</td>
<td></td>
<td>(.05)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Joint test for community</td>
<td>chi2(8) = 92.63</td>
<td></td>
<td>chi2(1) = 11.90</td>
<td>chi2(2) =9.71</td>
<td>chi2(6)= 90.01</td>
<td>chi2(6) = 17.71</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dummies</td>
<td>Prob &gt; chi2 = 0.00</td>
<td>Prob &gt; chi2 = 0.00</td>
<td>Prob &gt; chi2= 0.01</td>
<td>Prob &gt; chi2 = 0.00</td>
<td>Prob &gt; chi2 = 0.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Calculated using LAMP Survey Data. Notes: ***, ** and * Signify statistically different from zero at the 1%, 5% and 10% level, respectively. (*) dF/dx is for discrete change of dummy variable from 0 to 1. z and P>|z| correspond to the test of the Underlying coefficient being 0.
Table 2-7 Probit Regression (Dummies for Size of Remittances Relative to Income)

<table>
<thead>
<tr>
<th>Businessholding</th>
<th>Coef.</th>
<th>z</th>
<th>dF/dx</th>
<th>Coef.</th>
<th>z</th>
<th>dF/dx</th>
<th>Coef.</th>
<th>z</th>
<th>dF/dx</th>
<th>Coef.</th>
<th>z</th>
<th>dF/dx</th>
<th>Coef.</th>
<th>z</th>
<th>dF/dx</th>
<th>Coef.</th>
<th>z</th>
<th>dF/dx</th>
<th>Var. Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remsmall</td>
<td>0.28** (0.13)</td>
<td>2.14</td>
<td>0.10</td>
<td>0.35</td>
<td>(0.23)</td>
<td>1.52</td>
<td>0.12</td>
<td>-0.02</td>
<td>(0.28)</td>
<td>-0.08</td>
<td>-0.01</td>
<td>0.03</td>
<td>(0.21)</td>
<td>1.15</td>
<td>0.01</td>
<td>-0.36**</td>
<td>-2.12</td>
<td>-2.12</td>
<td>Binary</td>
</tr>
<tr>
<td>Remmedium</td>
<td>0.24</td>
<td>(0.29)</td>
<td>0.82</td>
<td>0.09</td>
<td>0.22</td>
<td>(0.26)</td>
<td>0.83</td>
<td>0.08</td>
<td>0.47</td>
<td>(0.49)</td>
<td>0.96</td>
<td>0.17</td>
<td>0.49*</td>
<td>(0.27)</td>
<td>1.82</td>
<td>0.12</td>
<td>-0.62***</td>
<td>-2.20</td>
<td>-1.16</td>
</tr>
<tr>
<td>Remlarge</td>
<td>-0.07</td>
<td>(0.18)</td>
<td>-0.42</td>
<td>-0.02</td>
<td>-0.22</td>
<td>(0.23)</td>
<td>0.54</td>
<td>0.05</td>
<td>-0.15</td>
<td>(0.19)</td>
<td>-0.79</td>
<td>-0.06</td>
<td>-0.00</td>
<td>(0.24)</td>
<td>0.00</td>
<td>-0.00</td>
<td>0.00</td>
<td>-0.42*</td>
<td>-1.81</td>
</tr>
<tr>
<td>Hage</td>
<td>0.08***</td>
<td>(0.01)</td>
<td>6.03</td>
<td>0.03</td>
<td>0.01</td>
<td>(0.04)</td>
<td>0.17</td>
<td>0.00</td>
<td>0.05***</td>
<td>(0.02)</td>
<td>2.32</td>
<td>0.02</td>
<td>0.05***</td>
<td>(0.02)</td>
<td>3.00</td>
<td>0.02</td>
<td>0.06**</td>
<td>2.16</td>
<td>0.02</td>
</tr>
<tr>
<td>Agesquared</td>
<td>-0.00***</td>
<td>(0.00)</td>
<td>-5.61</td>
<td>-0.00</td>
<td>0.00</td>
<td>(0.00)</td>
<td>-0.55</td>
<td>0.00</td>
<td>-0.00**</td>
<td>(0.00)</td>
<td>-2.16</td>
<td>-0.00</td>
<td>-0.00***</td>
<td>(0.00)</td>
<td>-3.14</td>
<td>-0.00</td>
<td>-0.00**</td>
<td>-2.17</td>
<td>-0.00</td>
</tr>
<tr>
<td>Hsex</td>
<td>0.09</td>
<td>(0.09)</td>
<td>0.93</td>
<td>0.03</td>
<td>0.25</td>
<td>(0.21)</td>
<td>1.19</td>
<td>0.10</td>
<td>0.21</td>
<td>(0.19)</td>
<td>1.15</td>
<td>0.08</td>
<td>0.22**</td>
<td>(0.12)</td>
<td>1.96</td>
<td>0.08</td>
<td>0.47***</td>
<td>3.13</td>
<td>0.14</td>
</tr>
<tr>
<td>Maritalstatus</td>
<td>0.20*</td>
<td>(0.10)</td>
<td>1.90</td>
<td>0.08</td>
<td>-0.14</td>
<td>(0.23)</td>
<td>-0.60</td>
<td>-0.05</td>
<td>0.12</td>
<td>(0.28)</td>
<td>0.42</td>
<td>0.05</td>
<td>0.35***</td>
<td>(0.11)</td>
<td>3.10</td>
<td>0.13</td>
<td>0.26*</td>
<td>1.79</td>
<td>0.08</td>
</tr>
<tr>
<td>Heducation</td>
<td>0.00</td>
<td>(0.01)</td>
<td>0.30</td>
<td>0.00</td>
<td>-0.04**</td>
<td>(0.02)</td>
<td>-2.05</td>
<td>-0.02</td>
<td>0.01</td>
<td>(0.01)</td>
<td>1.05</td>
<td>0.01</td>
<td>0.02*</td>
<td>(0.01)</td>
<td>1.72</td>
<td>0.01</td>
<td>0.02</td>
<td>1.50</td>
<td>0.01</td>
</tr>
<tr>
<td>Nonworkers</td>
<td>-0.91***</td>
<td>(0.14)</td>
<td>-6.46</td>
<td>-0.36</td>
<td>-0.97***</td>
<td>(0.33)</td>
<td>-2.95</td>
<td>-0.37</td>
<td>-0.50*</td>
<td>(0.28)</td>
<td>-1.80</td>
<td>-0.20</td>
<td>-0.25*</td>
<td>(0.15)</td>
<td>-1.72</td>
<td>-0.09</td>
<td>-0.37*</td>
<td>-1.86</td>
<td>-0.12</td>
</tr>
<tr>
<td>Pastlandholding</td>
<td>0.47**</td>
<td>(0.24)</td>
<td>1.96</td>
<td>0.19</td>
<td>0.05</td>
<td>(0.57)</td>
<td>0.09</td>
<td>0.02</td>
<td>-0.79</td>
<td>(0.72)</td>
<td>-1.10</td>
<td>-0.30</td>
<td>0.66***</td>
<td>(0.15)</td>
<td>4.37</td>
<td>0.26</td>
<td>0.83***</td>
<td>2.55</td>
<td>0.31</td>
</tr>
<tr>
<td>Uspastexperience</td>
<td>0.27***</td>
<td>(0.09)</td>
<td>2.85</td>
<td>0.10</td>
<td>-0.06</td>
<td>(0.22)</td>
<td>-0.27</td>
<td>-0.02</td>
<td>0.51***</td>
<td>(0.15)</td>
<td>3.52</td>
<td>0.20</td>
<td>0.17***</td>
<td>(0.07)</td>
<td>2.27</td>
<td>0.06</td>
<td>0.56***</td>
<td>4.90</td>
<td>0.17</td>
</tr>
</tbody>
</table>
Table 2-7 (cont) Probit Regression (Dummy for Size of Remittances Relative to Income)

<table>
<thead>
<tr>
<th>Businessholding</th>
<th>Coef.</th>
<th>z</th>
<th>dF/dx</th>
<th>Coef.</th>
<th>z</th>
<th>dF/dx</th>
<th>Coef.</th>
<th>z</th>
<th>dF/dx</th>
<th>Coef.</th>
<th>z</th>
<th>dF/dx</th>
<th>Coef.</th>
<th>z</th>
<th>dF/dx</th>
<th>Var. Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community2</td>
<td>-0.41*** (0.15)</td>
<td>-2.81</td>
<td>-0.12</td>
<td>-0.02 (0.24)</td>
<td>-0.09</td>
<td>-0.01</td>
<td>0.17 (0.14)</td>
<td>1.18</td>
<td>0.06</td>
<td>1.02*** (0.15)</td>
<td>6.63</td>
<td>0.31</td>
<td>0.21 (0.20)</td>
<td>1.04</td>
<td>0.07</td>
<td>Categorical</td>
</tr>
<tr>
<td>Community3</td>
<td>0.53*** (0.14)</td>
<td>3.88</td>
<td>0.20</td>
<td>-0.65*** (0.22)</td>
<td>-2.98</td>
<td>-0.26</td>
<td>-0.25** (0.14)</td>
<td>-1.88</td>
<td>-0.10</td>
<td>1.37*** (0.16)</td>
<td>8.76</td>
<td>0.45</td>
<td>0.33* (0.20)</td>
<td>1.67</td>
<td>0.12</td>
<td>Categorical</td>
</tr>
<tr>
<td>Community4</td>
<td>0.52*** (0.13)</td>
<td>3.86</td>
<td>0.20</td>
<td></td>
<td></td>
<td></td>
<td>1.21*** (0.17)</td>
<td>7.32</td>
<td>0.38</td>
<td>0.11 (0.20)</td>
<td>0.55</td>
<td>0.04</td>
<td>Categorical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community5</td>
<td>0.62*** (0.13)</td>
<td>4.58</td>
<td>0.24</td>
<td></td>
<td></td>
<td></td>
<td>0.80*** (0.15)</td>
<td>5.20</td>
<td>0.22</td>
<td>-0.08 (0.18)</td>
<td>-0.46</td>
<td>-0.03</td>
<td>Categorical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community6</td>
<td>0.54*** (0.18)</td>
<td>3.09</td>
<td>0.20</td>
<td></td>
<td></td>
<td></td>
<td>0.78*** (0.17)</td>
<td>4.53</td>
<td>0.22</td>
<td>0.39*** (0.18)</td>
<td>2.19</td>
<td>0.14</td>
<td>Categorical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community7</td>
<td>0.29* (0.17)</td>
<td>1.68</td>
<td>0.10</td>
<td></td>
<td></td>
<td></td>
<td>0.74*** (0.16)</td>
<td>4.73</td>
<td>0.20</td>
<td>-0.30 (0.18)</td>
<td>-1.60</td>
<td>-0.09</td>
<td>Categorical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community8</td>
<td>0.67*** (0.14)</td>
<td>4.86</td>
<td>0.26</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Categorical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community9</td>
<td>0.45*** (0.14)</td>
<td>3.23</td>
<td>0.17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Categorical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-2.44*** (0.39)</td>
<td>-6.24</td>
<td>1.36 (1.09)</td>
<td>1.26</td>
<td>-1.27*** (0.69)</td>
<td>-1.91</td>
<td>-2.77*** (0.43)</td>
<td>-6.49</td>
<td></td>
<td>-2.41*** (0.66)</td>
<td>-3.64</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total effect of age</td>
<td>0.02*** (0.002)</td>
<td>6.24</td>
<td>-0.00 (0.008)</td>
<td>-0.16</td>
<td>0.01*** (.004)</td>
<td>2.38</td>
<td>0.01*** (.003)</td>
<td>2.81</td>
<td>0.01*** (.005)</td>
<td>2.43</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Joint test for community dummies</td>
<td>chi2(8) = 92.10</td>
<td>Prob &gt; chi2 = 0.00</td>
<td>chi2(2) = 12.20</td>
<td>Prob &gt; chi2 = 0.00</td>
<td>chi2(2) = 9.71</td>
<td>Prob &gt; chi2 = 0.01</td>
<td>chi2(6) = 90.01</td>
<td>Prob &gt; chi2 = 0.00</td>
<td>chi2(6) = 19.73</td>
<td>Prob &gt; chi2 = 0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Calculated using LAMP Survey Data. Notes: ***, ** and * Signify statistically different from zero at the 1%, 5% and 10% level, respectively. (*) dF/dx is for discrete change of dummy variable from 0 to 1. z and P>|z| correspond to the test of the Underlying coefficient being 0.
APPENDIX I

LAMP Household Survey Data

LAMP data is available at http://lamp.opr.princeton.edu/nicaragua/communities/nic-comm1-en.htm. “HOUSE” file contains general characteristics of the household, its members. “PERS” file contains demographic and migratory information for each member of a surveyed household. “MIG file” contains comprehensive information on the migratory experience of each migrant household head. “LIFE” file provides detailed information on labour and family histories for each head of household and “SPOUSE” file provides detailed labour histories of their spouses. Lastly, “COMMUN” file provides information on the communities surveyed.

Latin American Migration Project (LAMP) used four different locations to represent each of four levels of urbanization: rural area, towns, mid-sized cities and metropolitan settings. In all cases the neighbourhood must have at least 1,200 dwellings, from which a random sample of between 100 to 200 households was taken to ensure a high degree of representativeness at the community level. Moreover, LAMP complements each survey with a snowball interview considering at most 20 migrants from the same community who have settled in the US. Snowball sampling is a nonprobability technique for developing a research sample. It relies on referrals from initial subjects to generate additional subjects; hence, the sample group appears to grow like a rolling snowball. Though snowball sampling actually reduces the possibility that the sample will represent a good cross section from the population.

The LAMP questionnaire followed a flexible, unobtrusive and non-threatening format and was tailored to match the particular circumstances prevalent in each host countries. The questionnaire was applied in three phases - in the first phase, basic social and demographic data were collected from all members of the household, the second phase compiled a year-by-year life history for all household heads, and the final phase gathered information about the household head's experiences on his or her most recent trip to the United States.
APPENDIX II

Variable Definitions

Businessholding: Existence of household businesses (1 if yes, otherwise 0).

Remreceive: Household receive remittances from family members residing in the US (1 if yes, otherwise 0).

Hage: Age of the household head.

Hsex: Gender of the household head (1 if male, otherwise 0).

Maritalstatus: Marital status of the household head (1 if married, consensual union or widowed, otherwise 0).

Heducation: Years of schooling of the household head.

Nonworkers: Ratio of non-working age family members to the total number of family members.

Pastlandholding: Past land owned by the household (1 if yes, otherwise 0).

Uspastexperience: Ratio of total household members with US experience to the total number of household members.

Ucurrenttrip: Ratio of total number of US Migrant to the total number of family members.

Employmentstatus: Household head’s current employment (1 if yes, otherwise 0).

Curlandholding: Current land holding of the household (1 if yes, otherwise 0).

Commundummy: The set of community dummy variables.

Country Groupings

Country groupings are World Bank definitions. (1) High-income economies are those in which 2008 GNI per capita was $11,906 or more. Includes countries in: European Monetary Union, High income: OECD and High income: non-OECD groups. (Low- and middle-income economies are those in which 2008 GNI per capita was $11,905 or less. It includes the following country groups: East Asia & Pacific, Europe & Central Asia, Latin America & Caribbean, Middle East & North Africa, South Asia and Sub-Saharan Africa.
APPENDIX III

Bivariate Probit Model and Recursive Bivariate Probit Model

Bivariate probit model considers two binary outcomes where the binary outcomes are potentially related after conditioning on regressors. In other words, there may be correlation between the errors of the two equations. The general specification of the bivariate probit model with correlated disturbances would be

\[
\begin{align*}
    y_1^* &= x_1' \beta_1 + \epsilon_1, \quad y_1 = 1 \text{ if } y_1^* > 0, 0 \text{ otherwise} \\
    y_2^* &= x_2' \beta_2 + \epsilon_2, \quad y_2 = 1 \text{ if } y_2^* > 0, 0 \text{ otherwise} \\
    E[\epsilon_1 | x_1, x_2] &= E[\epsilon_2 | x_1, x_2] = 0 \\
    \text{Var}[\epsilon_1 | x_1, x_2] &= \text{Var}[\epsilon_2 | x_1, x_2] = 1 \\
    \text{Cov}[\epsilon_1, \epsilon_2 | x_1, x_2] &= \rho
\end{align*}
\]

The observable counterparts to the two latent variables \(y_1^*\) and \(y_2^*\) are \(y_1\) and \(y_2\); these variables are observed as 1 if their respective latent variables are positive and zero otherwise. The errors \(\epsilon_1\) and \(\epsilon_2\) are jointly normally distributed with means of 0, variances of 1, and correlations of \(\rho\). The functional form of the recursive bivariate probit model is as follows

\[
\begin{align*}
    y_1^* &= x_1' \beta_1 + y_2 + \epsilon_1, \quad y_1 = 1 \text{ if } y_1^* > 0, 0 \text{ otherwise} \\
    y_2^* &= x_2' \beta_2 + \epsilon_2, \quad y_2 = 1 \text{ if } y_2^* > 0, 0 \text{ otherwise}
\end{align*}
\]

where \(y_1\) is the binary dependent variable of interest, the second dependent variable, \(y_2\), appears on the right hand side of the first equation; \(x_1\) and \(x_2\) are corresponding regressor vectors of two regression equations. The disturbance \(\epsilon_1\) and \(\epsilon_2\) are normally distributed with a correlation of \(\rho\). The correlation coefficient measures the effect after the influence of the endogenous variable is accounted for in the first equation. The equation system is identified if disturbances are independent \([\text{corr}(\epsilon_1, \epsilon_2) = \rho = 0]\) or if there is at least one exogenous variable in \(x_2\) that is not included in \(x_1\) (Maddala, 1983). The endogenous nature of variables on the right-hand side of the first equation can be ignored in formulating the log-likelihood function. In the bivariate probit model if the two dependent variables are jointly determined, one could place each/any of them on the right hand side of the other equation and continue as if there were no simultaneity problem (Greene, 2002).
Marginal Effect, and Total Marginal Effect

There are mainly two methods of estimating marginal effects (Bartus 2005). (i) **AME** (average marginal effect): it is the computation of the average of discrete or partial changes over all observations (ii) **MEM** (marginal effects at the mean: it is the computation of marginal effects at fixed values (e.g., sample means) of the independent variables. In case of a single-equation regression model, \( E(y) = F(\beta x) \), where \( \beta x \) denotes the linear combination of parameters and variables and \( F(\cdot) \) is the cdf that maps the values of \( \beta x \) to the \([0,1]\) interval, marginal effects measure the change in the expected value of \( y \) when one independent variable increases by unity considering all other variables constant. Therefore, the **AME** of the ith explanatory variable will be

\[
AME_i = \frac{1}{n} \sum_{k=1}^{n} (F(\beta x^k + \beta_i) - F(\beta x^k))
\]

and the **MEM** will be

\[
MEM_i = F(\beta \bar{x} + \beta_i) - F(\beta \bar{x})
\]

However, for continuous variables, researchers often estimate the effect of an infinitely small change. Let \( f(\cdot) \) be the derivative of \( F(\cdot) \) with respect to \( \beta x \). If \( x_i \) is a continuous variable, then the **AME** of the ith continuous variable will be

\[
AME_i = \beta_i \frac{1}{n} \sum_{k=1}^{n} f(\beta x^k)
\]

where \( \beta x^k \) denotes the value of the linear combination of parameters and variables for the \( k \)th observation. If \( \bar{x} \) denotes a vector containing the means of the explanatory variables, the **MEM** for \( x_i \) is defined as

\[
MEM_i = \beta_i f(\beta \bar{x})
\]

There are also distinct formulas to estimate marginal effects for dummy variables In this case, \( AME_i = \frac{1}{n} \sum_{k=1}^{n} [F(\beta x^k | x_i = 1) - F(\beta x^k | x_i = 0)] \) and

\[
MEM_i = F(\beta \bar{x} | x_i = 1) - F(\beta \bar{x} | x_i = 0),
\]

which avoid the problem of setting dummy variables to means.

If the regression model includes polynomial term of a continuous variable, the total marginal effect of that continuous variable can be found by combining the direct and indirect effect. The direct effect is just the marginal effect of \( x \) such that \( x \) influenced only the outcome but not \( g(x) \), the mathematical transformation. The indirect effect is the marginal effect of \( g(x) \) times the derivative of \( g(x) \). The indirect effect considers the effect of \( x \) on \( g(x) \) and the effect of \( g(x) \) on the outcome while considering other things constant. Mathematically, if \( z^j (j = 1, \ldots, J) \) denote the jth mathematical transformation of \( xi \), the total marginal effects of \( xi \) are defined by
The computation of total marginal effect is much easier if one uses MEMs instead of AMEs. In case of MEMs, the derivative of any $g_j(x)$ is a scalar, e.g., the derivative of age squared with respect to age is $2\bar{x}$. If the average age in the sample is, for instance, 50 years, then the total marginal effect of age is the marginal effect of age plus 100 times the marginal effect of age squared.
Chapter 3

AID VERSUS REMITTANCES
WHICH WORKS BETTER?

3.1 Introduction

Unrestricted financial flows allow capital to move freely around the globe to find the most productive investments. In the neo–classical growth models, the benefits of capital flows into capital-scarce, poor countries are in essence derived from divergences in the marginal productivity of capital. For instance, Kemp–MacDougall (1964), assuming full investment of capital inflow, proposes that under perfect capital mobility and decreasing returns to capital, the poor country will benefit from capital inflows as long as its marginal product of capital is equal to that of the rich country.\(^\text{13}\) Endogenous growth models assume non–decreasing returns to the set of reproducible factors of production. For instance, Romer (1986) proposes that in the absence of any arbitrage between physical and human capital, their ratio remains constant over time implying that any increase in physical capital produce an upsurge in human capital. And due to such externalities, the benefit of capital flows into capital scarce poor countries is likely to be higher than those specified by the standard neo–classical approach. Therefore, capital inflows can be advantageous for the recipient country if they augment capital accumulation by adding to domestic savings rather than crowding them out, improve the recipient economy’s efficiency by enhancing domestic competition and reducing capital costs for local entrepreneurs, intensify transfer of better technologies and accumulation

\(^\text{13}\) The two–country Kemp–MacDougall model (introduced by G.D.A. MacDougall, 1958 and expanded by M.C. Kemp 1964) considers that in isolation the marginal product of capital is higher in the capital scarce (poor) country compared to the capital abundant (rich) country, and is diminishing in both countries with rising capital–labour ratios. Assuming that the capital inflow is invested, not consumed, the Kemp–MacDougall theory proposes that if capital can move freely, the poor country will benefit from capital inflows as long as its marginal product of capital is equal to that of the rich country.
of skill by individuals. Some risks are also associated with capital inflows. For instance, it could produce welfare losses due to distorted consumption and production patterns (Reisen and Soto 2001). Negative swings in foreign savings may result in output losses, widespread bankruptcies, destroy local credit channels and make human capital obsolete (Bailliu 2000).

For the last few decades, some capital-deficient Low and Middle Income Countries relied heavily on concessional foreign loans in order to achieve rapid economic growth. But the growth experience of many of these countries was not satisfactory and, as a result, they accumulated a large stock of external debt and are now facing serious debt servicing problems. One of the most widely discussed negative impacts of aid corresponds to the fact that it appreciates the real exchange rate through its bias towards non-tradable goods and reduces export competitiveness (Elbadawi, 1999). Moreover, aid is highly volatile and overwhelmingly pro-cyclical relative to donor’s economy (Robe and Pallage, 2001). Aid is fungible. Excess aid inflow may be used to invest in low productivity sectors and/or to increase government consumption spending and/or to fund tax reduction (Tarhan et al, 1998). Though aid increases the funds available to the government for the programme of public services but at the same time add to the amount of resources that are ‘up for grabs’ (Blackburn and Forgues-Puccio 2007). There is a monotonic relationship such that an increase in aid produces an increase in corruption (e.g., Knack 2001; Alesina and Weder 2002; Bräutigam and Knack 2004; Rajan and Subramanian 2007; Economides et al. 2008). However, the proponents of “Big push theory” argue that the reason behind the ineffectiveness of aid was that they were simply insufficient.14 Injection of substantial amounts of aid would help Low Income Countries to escape from poverty traps. But critics of this approach argued that three decades of overseas assistance to poor countries have done little or nothing to alleviate poverty, but have promoted corruption and assist

14 The “Big Push model” (introduced by Rosenstein-Rodan 1943) states that in order to overcome the economic obstacles, an underdeveloped economy requires a considerable amount of investment. Small bit of investment is not sufficient to escape the “underdevelopment trap”. According to them, publicly coordinated investment can break the vicious circle by assisting economies to overcome insufficiencies in private incentives. Adoption of modern production techniques helps attaining economies of scale, which in turn create demand spill-overs, enlarge market size, and create a self-sustaining growth path that allows the economy to choose large-scale industrialization over agriculture and small-scale production as a Pareto preferred Nash equilibrium.
bad governments to remain in power (e.g., Easterly 2006a). However, during the last few years, the proportion of concessional foreign loans has been declining in many of these developing countries and the level of officially recorded remittance flow has greatly increased due to supportive government initiatives, especially, reduction in transaction cost and better access to formal transfer services. Such an increasing remittance flow may not only improve the balance of payment position of these countries but also can mitigate the problem of limited credit availability for private investment when such problems arise as a result of increasing government dependence on domestic sources due to declining aid inflow.

Fig 3-1 – Fig 3-3 highlights some facts regarding the growth of GDP and trends of capital flows in Low and Middle Income Countries since the last three decades. (i) In case of GDP growth per capita, the Middle Income Countries are experiencing relatively higher growth whereas the Low Income Countries are lagging behind. (ii) In case of capital inflows, the Middle Income Countries are receiving increasing amount of remittances which is comparable to the amount of FDI, and well above the volume of aid. In contrast, the Low Income Countries are receiving increasing amount of aid which is well above the volume of FDI and remittances. (iii) In Middle Income countries, remittance-GDP ratio has been growing substantially. But in Low Income Countries, though the remittance-GDP ratio has been rising, the aid-GDP ratio has been increasing significantly. (iv) During the last three decades, the annual percentage growth of remittances has always been positive whereas annual percentage growth of aid and FDI fluctuated a lot (from positive to negative) in these Low and Middle Income Countries. In sum, the Middle Income Countries that are less dependent on foreign aid and more dependent on remittances are experiencing relatively higher GDP growth; whereas the Low Income Countries that are more dependent on foreign aid and less dependent on remittances are suffering from a relatively lower GDP growth. These facts raise the question about the relative effectiveness of aid and remittances and in this study we examined which of these two works better in enhancing growth and development.

In recent decades there has been a resurgence of interest in the study of the aid-growth and FDI-growth relationship. But there are actually very few macro-level studies that
investigate the growth-remittance relationship. To the best of my knowledge there is no empirical work that incorporates these three most important flows of capital (i.e., aid, FDI and remittance) in growth regressions to identify their true impact on growth. In this study the econometric analysis was built around formal dynamic growth model. Recently developed estimation techniques for dynamic nonstationary heterogeneous panel with large N and T which deals with endogeneity of regressors were used. We found novel evidence of quite the opposite effect of the two main forms of external capital - foreign aid has a detrimental effect whereas international remittances have a favourable effect on GDP growth per capita. The result is robust to different estimation techniques and variable specifications. We argued that remittances have favourable impact on growth as it is more effective than foreign aid in augmenting capital accumulation. The theoretical model on aid and remittances presented at the end of this chapter justifies this argument. It is based on a dynamic general equilibrium model where capital accumulation is driven by foreign aid and international remittances. Aid and remittances are both found to be supportive of capital accumulation, but remittances are more efficient in doing so.

The remainder of the chapter is organised as follows. Section 3.2 reviews the recent literature. Section 3.3 illustrates the data collection and generation. Section 3.4 describes the characteristics of panel data. Section 3.5 depicts the choice of estimator and regression results. Section 3.6 presents a theoretical model on aid, remittances, and corruption. Section 3.7 provides concluding remarks. The remainder of the chapter is organised as follows. Section 3.2 reviews the recent literature. Section 3.3 illustrates the model specification issues. Section 3.4 describes the empirical methodology and strategy. Section 3.5 describes the data collection and generation. Section 3.6 depicts the regression results. Section 3.7 presents a theoretical model on aid, remittances, and corruption. Section 3.8 provides concluding remarks.
3.2 Literature Review

3.2.1 Aid-growth Literature:

In the aid-growth empirical literature though numerous micro-based evaluations found aid to exert significant positive impact on growth, those at the macro level yielded mixed results in spite of refinements in econometric techniques and improvements in the quality of data. The studies during 1968-1972 focused on the effect of aid on savings and found it to be either negative or insignificant (e.g., Griffin 1970; Griffin and Enos 1970; Weisskopf 1972). The studies during early 1970s to the mid-1990s focused on the links between aid, investment and growth. For instance, Voivodas (1973) examined the relationship between foreign capital inflow and growth inherent in the two-gap model for a sample of 22 LDCs for the period 1956-1968 and found that the ordinarily beneficial effect of foreign capital inflow on growth is generally neutralized by either a substantial spillover of foreign capital to consumption or an increase in the incremental capital-output ratio or both. But this study did not disaggregate the source of foreign capital inflows to obtain more meaningful results. Papanek (1973) disaggregated capital flows into foreign aid, private capital and other inflows, reported a positive and significant aid coefficient, a finding corroborated in several other analyses that followed (e.g., Dowling and Hiemenz 1983; Gupta and Islam 1983). However, Mosley et al. (1987) did not find such direct positive relationship in a relatively larger sample of data.

The studies during late 1990s recognise that the relationship between aid and economic growth depends on whether the recipients are pursuing sound economic policies. Hadjimichael et al. (1995) are among the first to incorporate aid and macroeconomic policy variables within a growth equation. They found evidence of a positive effect for the period 1986 to 1992 using a sample of 41 developing countries. But this study did not

15 The “Two-gap” model proposes that the development of LDCs is constrained by two gaps: (1) savings gap (2) foreign exchange gap. Savings gap implies domestic savings are not enough to support the level of growth that is obtainable given the import purchasing power of the economy and the level of other resources. Foreign exchange gap implies that the import purchasing power conferred by the value of exports plus capital transfers may be insufficient to support the level of growth that is obtainable given the level of domestic saving. National income accounting theory proposes that these gaps are not independent.
consider the bi-directional relationship between aid and growth; the feedback of low growth into larger aid allocations was ignored. Boone (1996) applied panel econometric techniques on non-military aid flows to 96 countries and found that aid does not significantly increase investment and growth, nor benefit the poor as measured by improvements in human development indicators, but it does increase the size of government. He also found that the impact of aid does not vary according to whether recipient governments are liberal democratic or highly repressive. This result was subsequently challenged by a number of studies focusing on the fact that aid has a conditional positive effect on growth, i.e., the effect is context-specific and depends on particular circumstances. The evidence begins with the influential study of Burnside and Dollar (1997). Using a panel growth regressions for 56 developing countries and six four-year periods (1970-93), they found that though the ratio of aid to GDP often does not significantly affect growth, aid interacted with policy variables does. In their paper they constructed an index of policy effectiveness using measures of fiscal policy (the budget surplus), monetary policy (inflation) and trade policy (the degree of openness). They instrumented both aid and aid interacting with policies. Their findings of aid enhances growth in developing countries that score well on the index has been particularly influential amongst donors of aid. A similar result was obtained by Collier and Dollar (2001, 2002); introducing the World Bank Country Policy and Institutional Assessment index (CPIA) in growth regressions, they showed that an interaction term between aid and CPIA has a highly significant positive effect on GDP growth implying that found that foreign aid has favorable impact on growth, conditional on a stable macroeconomic policy environment.\(^\text{16}\)

However, a number of subsequent studies offered other recipient country characteristics as being important for effectiveness of foreign aid. Hansen and Tarp (2000) found that foreign aid can induce growth in countries both with favourable and with unfavourable

\(^{16}\) CPIA transparency, accountability, and corruption in the public sector rating, 1=low to 6=high. It considers the degree to which the executive are accountable for its usage of funds and for the outcomes of its actions by the electorate and by the legislature and judiciary, and the degree to which public employees within the executive are accountable for administrative decisions, use of resources, and outcomes obtained. The three key dimensions considered here are the answerability of the executive to oversight institutions and of public employees for their act, admittance of civil society to information on public affairs, and state capture by narrow vested interests. Source: World Bank Group, CPIA database.
policy environments, and increased foreign aid has a positive impact on growth as long as the ratio of aid to GDP is not excessively high or beyond a certain threshold. The concept of diminishing returns to aid was corroborated in several other analyses that followed (e.g., Dalgaard and Tarp 2004). Guillaumont and Chauvet (2001), constructing an index for environmental vulnerability, found that countries suffering from high environmental vulnerability grow slower but also that aid is more effective in them. Collier and Hoeffler (2002) found that the growth effect of aid is strongest a few years after the end of a conflict and therefore, the bulk of aid should not arrive just after the conflict as the country may not be prepared to allocate it properly. Roodman (2004), found that climate, particularly, the fraction of land in the tropics, is a very important predictor of aid effectiveness. Angeles and Neanidis (2009) found robust evidence of the importance of local elite as a determinant of the effectiveness of foreign aid in developing countries. However, Rajan and Subramanian (2005) found no evidence that aid works better in better policy or geographical environments, or that certain forms of aid work better than others.

Some studies have examined the growth effect of different categories of aid to find whether certain form of aid works better than other. For instance, the short-impact, long-impact and humanitarian aid (Clemens et al. 2004), geostrategic and non-geostrategic aid (Headey 2007), tied and untied aid (Miquel-Florensa 2007), and productive and pure aid (Chatterjee et al. 2003; Minoiu and Reddy 2010; Neanidis and Varvarigos 2009). More recently, Neanidis (2012) offered a connection between aid and growth that relates to demographic considerations. He found that humanitarian aid has on average a zero effect on the rates of fertility and of per capita output growth.

In sum, to some observers, there is little doubt that foreign aid has done much to alleviate the plight of many countries around the world. To others, there is little evidence to show that such huge international assistance over many years has made any significant change from the perspective of growth and development. Our study contributes to this debate.
3.2.2 Remittance-growth Literature

There is relatively little evidence about the relationship between remittances and growth since until recently such relationship was not highlighted in the remittance literature. In fact, the emphasis was on the unfavourable consequence of remittances on labour market of the recipient economy. Russell (1992) and McCormick and Wahba (2000) found remittances to perpetuate economic dependency that undermines the prospect for development. According to them, the flow of remittances lead to moral hazard as those remaining behind tend to exert less effort, knowing that the migrants will pay off any consumption shortfall. The flow of remittances reduces labour supply and makes the economy vulnerable to economic shocks in the host country. Azam and Gubert (2004) investigated whether migration generates moral hazard and results in lower technical efficiency in agriculture. They found that, even if migration augments the use of improved agricultural technology, the families with reliable migrants are much further below the efficiency frontier than those without. Kapur et al (2003) pointed out that international remittance flow propagate a culture of economic dependency to the extent that household use remittance income only for consumption. Chami et al. (2003) found remittances not to be intended to serve as capital for economic development, but as compensation for poor economic performance. Altruistically motivated remittances intend to compensate their recipients for bad economic outcomes, and thus have a negative relationship with GDP growth. Some studies pointed to adverse effect on remittances through currency appreciation. According to Ratha (2007), large remittance inflows, like any other foreign currency inflows, can cause an appreciation of the real exchange rate and raise the international price of traditional exports. The potential occurrence of “Dutch disease” effects can deteriorate the economy’s balance payment position and worsen the welfare of families not receiving remittances. Although empirical evidence of such “Dutch disease” effects of remittances is still lacking, they are likely to be large in small economies. However, Rajan and Subramanian (2005) did not find any evidence that flow of remittances results in adverse competitiveness as they tend to dry up if an exchange rate starts getting overvalued.
Some studies focused on the fact that remittances offer some prospects for economic growth and development, beyond those offered solely by domestic economic opportunities. Connell and Conway (2000), using data on the South Pacific and the Caribbean, found that remittance is a very important private transfer of capital. Remittances provide both foreign exchange and additional savings for economic development. Return migrants represent people endowed with human capital, capable of enriching the social and cultural capital stocks of their communities, offers brain gains as development potential. Some studies found remittances to stimulate growth in less financially developed economy as it serves as a substitute for financial access. Fajnzylber and López (2008), using data on Latin American countries and employing external and time-varying instrumental variables to correct reverse causality and other sources of endogeneity, found remittances to raise investment and enhance growth in countries with higher levels of human capital, strong institutions, good policy environments and less developed financial system. He argued that remittances ease liquidity constraints faced by the poor, and that these constraints are more relevant in countries with less developed financial system. Giuliano and Ruiz-Arranz (2008), using data on 100 developing countries, found that remittances act as a substitute for the domestic financial system when they cannot meet the credit needs of local entrepreneurs. Though they found robust evidence that remittances facilitate growth in less financially developed countries, they did not find any evidence that remittances have any impact on growth in countries with well-functioning domestic financial markets.

Recent studies focused the effect of remittances on financial development to explain how the effect of remittances on long-term growth takes shape. Billmeier and Massa (2009), assessing the macroeconomic determinants of stock market capitalization in a panel of 17 emerging markets in the Middle East and Central Asia, including both hydrocarbon-rich countries and economies without sizeable natural resources found that in resource-rich countries, stock market capitalization is mainly driven by the oil price but in resource-poor countries, stock market capitalization is mainly driven by remittances and quality of institutions. Gupta et al. (2009) found robust evidence of the steadily growing remittance flows to sub-Saharan Africa to have a direct poverty-mitigating effect through promoting financial development. They postulated that formalizing such flows can serve as an
effective access point for “unbanked” individuals, and households to avail the products offered by formal financial providers. Aggarwal et al. (2010), using data on a large number of developing countries over a long period, studied the association between remittances and the aggregate level of deposits and credit intermediated by the local banking sector. They found robust evidence of a positive and significant link between remittances and financial deepening. Rao and Hassan (2011), using the System-GMM method on panel data, found that remittances do not have any significant direct growth effects; but, there are two channels through which remittances have indirect growth effects, investment and development of the financial sector. Similarly, Chowdhury (2011) found that in Bangladesh remittances have a significant positive effect on financial development. However, financial sector's development is neutral in its effect on the inflow of remittances. Demirguc-Kunt et al. (2011), using municipality-level data on Mexico, found evidence that remittances are strongly associated with greater banking breadth and depth, increasing the number of branches and accounts per capita and the amount of deposits to GDP. Their findings are robust to the potential endogeneity of remittances, inclusion of a wide range of controls and even municipal fixed effects specifications.

To sum, there is huge debate among the academic and policy-oriented researchers about the relative contribution of international migrants’ remittances to economic development. There is still no consensus over whether remittances contribute to longer-term growth by building human and financial capital or degrade long-run growth by creating labour substitution and ‘Dutch disease’ effects. Our study also contributes to this debate.

3.3 Model Specification Issues

Equation (3.1) is a general form of growth model where growth is a function of the rate of investment in physical capital, the rate of investment in human capital and the rate of population growth.
\[
\Delta \ln y_{i,t} = a_0 - \theta_1 \ln y_{i,t-1} + a_1 \ln s_{k,t} + a_2 \ln s_{h,t} - a_3 \ln n_{i,t} + \varepsilon_{i,t} \tag{3.1}
\]

Equation (3.2) is the error correction version of the growth model

\[
\Delta \ln y_{i,t} = -\theta_1 [\Delta \ln y_{i,t-1} - \theta_2 \Delta \ln s_{k,t} + \theta_3 \ln(n_{i,t}) - \theta_4, i] + b_1 \Delta \ln s_{k,t} + b_2 \Delta \ln h_{k,t} + b_3 \Delta \ln(n_{i,t}) + \varepsilon_{i,t} \tag{3.2}
\]

where \( \theta_i = \frac{\hat{\theta}_i}{\theta} \) represents the long-run coefficients.\(^{17}\)

In macroeconomics, savings is regarded as a critical factor to explain rate of physical capital accumulation (\(\ln s_{k,t}\)). In addition to domestic savings, foreign savings, for instance, foreign aid, FDI and remittances are expected to augment investment in physical capital. Foreign aid will add to public investment, FDI will augment corporate investment and remittance will boost household investment. Stark (1978) explained that additional income from remittances will increase the volume of investment even if the actual cash remitted is not invested as it frees up resources that can be invested. Romer (1989) explained that the initial level of a variable like literacy may be important for understanding subsequent growth; he found that initial level of literacy help predict the subsequent rate of investment, and the rate of growth. We used adult literacy rate as a proxy for rate of human capital accumulation (\(\ln s_{h,t}\)). And we used population growth rate (\(n_{i,t}\)) to control for its impact on GDP growth per capita. These are the variables we considered in our basic growth regression equation.

### 3.4 Empirical Methodology and Strategy

We first review the main properties of the panels’ variables in terms of endogeneity and non-stationarity and then relate them to the choice of estimator.

---

\(^{17}\) See Mankiw et al (1992) and Bassanini et al (2001) for details.
3.4.1 Panel’s Characteristics

Endogeneity arises if there is simultaneous determination of the independent and the dependent variable i.e., if there is a bi-directional causation between these two variables. In the literature it is well established that foreign aid, FDI, and remittances are endogenous with respect to the GDP. In case of foreign aid, poor growth may result in larger allocations. Levy (1988) was among the first who found the amount of aid to be influenced by present or expected future growth rates. The inability of a country to achieve higher growth rates with available resources as other developing countries make it a potential candidate for higher aid allocation. In case remittances, one would predict greater remittance flow when growth is relatively low. Barajas et al (2009) found that low economic growth in the home country increases outward migration and remittances. Moreover, existing altruistic migrants increase compensatory transfers if there is recession in the home country. But in case of FDI, growing countries would attract more foreign capital compared to a stagnant or slow growing economy. Foreign investors look for economies that offer more profitable opportunities. Chowdhury and Mavrotas (2006), Saha (2005) and Choe (2003) found that FDI growth and economic growth are significant determinants of each other. Therefore, in this study we considered such reverse causalities while doing the regression analysis.

In large N, large T dynamic panels, non-stationarity could be a concern. Stationary process implies that the parameters, i.e., the mean and variance, will not change over time. Non-stationary regressors are likely to generate “spurious” results such that conventional tests are biased toward finding a significant relationship among variables in levels when in fact none exists. To avoid such problem, before proceeding to the estimation one might check whether the regressors are stationary or difference stationary, i.e., I(0) or I(1). If they are I(1), cointegration tests should be performed to check whether there exists long run relationship between the dependent and the independent variables. In this study, we performed Fisher-type panel unit root test; it does not require strongly balanced data, and the individual series can have gaps). We also performed panel cointegration test developed by Persyn & Westerlund (2008) to test the long run relationship between the regressand and the regressors; this cointegration test allows that
the series can be of unequal length. Appendix-VII gives brief overview of the salient features of these unit root tests and cointegration tests.

### 3.4.2 DFE, MG and PMG Estimator

Now days, panel datasets are large enough in both spatial and temporal dimension. Recent advances in the nonstationary panel literature offer alternative estimation techniques to identify efficient parameters for large N large T dynamic panels. In this study we first applied three alternative estimation techniques, namely, the traditional dynamic fixed effect (DFE) estimator, the mean-group (MG) estimator of Pesaran and Smith (1995) and the pooled mean-group (PMG) estimator of Pesaran, Shin, and Smith (1999). The MG and PMG estimation are new techniques to estimate nonstationary heterogeneous dynamic panels. Appendix-VIII gives detail about these estimators and how these can estimate the error correction version of the growth model in equation (3.1) directly.

The DFE estimation requires pooling individual groups. It restricts the estimators of the cointegrating vector, the speed of adjustment coefficient and the short run coefficients to be equal across all panels. Thus in the DFE model all parameters, except intercepts, are constrained to be equal across panels. In contrast, MG estimator relies on estimating N time-series regressions and averaging the country specific and time-series parameter estimates. The parameters are simply the un-weighted means of the individual coefficients. This estimator allows the intercepts, slope coefficients, and error variances to vary across groups. Under slope coefficient’s heterogeneity, the MG is consistent. It was the first to consider complete parameter heterogeneity across cross-sections. However, it does not recognise that some economic conditions could be common across group of countries in the long-run. The PMG estimator fills such gap. It provides efficiency gains as it recognises the common economic features across the countries.

The PMG estimator combines both pooling and averaging and recognizes the diversity within each panel. It allows the intercepts, speed of convergence, short run coefficients, and error variances to differ freely across groups, but imposes homogeneity on long-run
coefficients. The long run coefficients are nonlinear function of short run parameters. There are several gains of using PMG estimator over other commonly used dynamic panel data estimators, for instance, panel dynamic OLS (DOLS) of Pedroni (2001) and panel fully modified OLS (FMOLS) of Pedroni (2000). DOLS and FMOLS requires pre-testing for unit roots in dependent and independent variables as well as pre-testing for cointegration between integrated regressors. The stationary variables that do not appear to be part of the estimated cointegrating vector are usually eliminated. The Fisher-type unit root test [table 3-5] shows that FDI, domestic saving, and population growth are stationary, I(0) and needs to be dropped in DOLS/FMOLS so as to keep the order of integration same. Therefore, we did not use these dynamic panel data estimators. But, Pesaran, Shin, and Smith (1997) had shown the consistency of the PMG estimator even if the variables of regression equation are integrated or stationary, endogenous or deterministic. Therefore, while estimating PMG estimator one might not need to check for the presence of unit roots in the panel variables. The PMG assumes cross-sectional independence of the regression residuals. In panels with large N and large T, it is also important that the regression errors are serially uncorrelated. According to Pesaran et al. (1999), inclusion of sufficient lags of the right-hand side regressors will ensure that the regression errors are serially uncorrelated and explanatory variables are exogenous and thus provide consistent and efficient parameters of interest.

Under heterogeneity of slope coefficient, the DFE approach would produce inconsistent and potentially misleading results. (Baltagi, Griffin, and Xiong, 2000). Hausman test check the validity of the DFE estimator against MG estimator. Under the assumption of homogenous long-run elasticities, both PMG and MG estimators are consistent. But if the true long-run parameters are heterogeneous, the PMG estimation might produce inefficient and inconsistent estimates. In this case, the MG estimates are consistent. The Hausman test examines the trade-off between consistency and efficiency in the choice between the two estimators. Hausman test first calculates the difference between the MG and PMG estimators. Then it compares the difference (scaled by the variance-covariance matrix of the efficient model) to critical values from the Chi-Squared distribution. Under the null hypothesis of cross-section parameter homogeneity in the long-run, one would
expect the difference to be small. Therefore $p$-values close to one would justify the superiority of the PMG over MG and the null hypothesis is accepted.\(^{18}\)

### 3.4.3 Dynamic GMM Estimator

Dynamic GMM estimation technique effectively deals with endogeneity and non-stationarity of regressors. In the “Difference GMM estimator”, proposed by Arellano – Bond (1991), the idea is to take first difference of the of the regression equation to remove unobservable time-invariant country-specific effects. Then the right hand side variables in the first difference equation are instrumented by lagged level which makes the endogenous variables pre-determined and, therefore, not correlated with the error term. The first-differenced lagged dependent variable is also instrumented with its past levels. However, Bond et al (2001) found that Difference-GMM have poor finite sample properties in terms of bias and imprecision. Moreover, lagged levels are poor instruments for first differences if the variables are close to a random walk. Arellano and Bover (1995) found that if the original equation in levels is added to the system, additional instruments can increase efficiency. Blundell and Bond (2001) proposed the “System GMM estimator” where the idea is to estimate a system of equations for both first-differences and levels and the additional instruments used in the levels equations are lagged first-difference of the series. Bond et al (2001) demonstrated that System-GMM can produce more reliable results for empirical growth research with larger time span estimator since it has superior finite sample properties. Hayakawa (2007) found that System-GMM produces less biased estimates than its difference counterpart. However, System-GMM requires that the first differenced instruments used for the variables in levels are not correlated with the unobserved country effects. “System GMM” uses more instruments than “Difference GMM”. The rule of thumb is to keep the number of instruments less than or equal to the number of groups, therefore, if $N$ is large, the standard practice is to use all available lags as instruments (Roodman, 2007).

\(^{18}\) However, the Hausman might suffer from low power as large standard errors of the MG estimates lead to an underestimation of the test statistic (Pesaran et al., 1999).
The Hansen (1982) J-test of over identifying restrictions with a null of “the instruments as a group are exogenous” checks the validity of the instruments. This test is consistent in the presence of both heteroscedasticity and autocorrelation of any pattern. We also performed the Arellano and Bond (1991) test for serial correlation. The Arellano – Bond test with a null of no autocorrelation is applied to the differenced residuals. The test for AR (1) process in first differences usually rejects the null which is expected. The test for AR (2) in first differences is more important, because it will detect autocorrelation in levels, if there is any. Presence of autocorrelation can cause a bias to both the estimated coefficients and standard errors.

3.5 Data Collection and Generation

In case of PMG estimation, the base line sample includes 42 Low and Middle Income Countries; the data is annual and the time period covered is from 1981 to 2008. Most of the data were collected from the World Bank’s World Development Indicators (WDI). Note that a number of Low and Middle Income Countries could not be included in the regression owing to the data requirements imposed by our choice of estimator. Countries having less than 90% data (25 data points out of 28) in any of the series of variables included in the regression model were dropped from the sample since our choice of estimator requires the time dimension to be long enough for each cross-section to enable estimation of the model separately for each country, and to subsequently allow for a sufficiently long lag length on (potentially endogenous) right-hand side variables to ensure white noise errors. Series like adult literacy rate follows a trend and so we used linear approximation to fill the missing values. The idea is to consider a straight line that best fit the data points of each series for each country separately and then fill the missing values using linear prediction given by the straight line. Appendix-IX explains the data generating process using Matlab codes and Appendix-X shows the process graphically.

Note that initially more than 42 countries survived when we applied the condition “drop countries from the sample if it has less that 80% data in any of the series of variables considered”. However, since PMG was unable to produce any result, we progressively looked for more balance panel such that PMG can produce results. It appeared that PMG started to produce results when we got a sample of 42 countries by applying the condition “drop countries from the sample if it has less that 90% data in any of the series of variables considered”.
In case of System-GMM estimation we were able to use a larger sample of 143 Low and Middle Income Countries over the period 1981-2008. The sample size includes all Low and Middle Income Countries in the sample since GMM does not require strongly balanced panel, and the time period starts from 1981 since CPI data is available from this period. GMM estimator better fits data with small T and large N and so we followed the standard approach of constructing four-year period averages (1981–84, 1985–88, 1989-92, 93-96, 1997-2000, 2001-04,2005–08) which is in line with the work by Bond et al. (2001). Although the use of larger time span may result in loss of important information, it would enable us to check the robustness of the results to a change in the time spans and also it would control the short-run business cycle fluctuations of output.

Along with the variables considered in the basic regression model, additional regressors were used e.g. trade openness, corruption perception index, rate of inflation, growth rate in money and quasi money, to check the robustness of the result under different variable specifications. It could be useful to reduce omitted variable bias, if there is any. It is well established that openness to trade elevates growth. Economies that are more open to international trade have access to advanced knowledge and technology, better variety of inputs for production. Moreover, exposure to competition results in higher efficiency of production (Frankel et al. 1996). Corruption is likely to lower investment, thereby lowering economic growth (Mauro, 1995). The inflation rate indicates the overall ability of the government to manage the economy, even low or moderate inflation rates have a temporary negative impact on growth rates, leading to significant and permanent reductions in per capita income (Andrés and Hernando, 1997). Moreover, variation in the quantity of money is an important determinant of economic growth (Handler, 1997). We also considered an alternative measure of human capital, school enrollment in order to check the strength of the results under alternative variable specification. Most of the data were collected from the World Bank’s World Development Indicators (WDI). However, we collected data on CPI from the webpage of Transparency International (TI): CPI average data for the period 1980-85 and 1988-92 and CPI annual data for the period 1995-2008 was collected from publications of Transparency International (TI).

20 Source: http://www.transparency.org/policy_research/surveys_indices/cpi
for the period 1985-88 is the average of CPI for the period 1980-85 and 1988-92. The CPI for the period 1993–96 was obtained from the average of the CPI annual data for the period 1995-96. The CPI for the period 1997–2000 was constructed by averaging the CPI annual data for the period 1997-2000 and so on. $\Delta \ln gdp_{pc}$ is the log difference in GDP per capita over a four year period, $\ln gdp_{t,1}$ is log of GDP per capita at the start of that period. Other explanatory variables are measured as the average over each four year period. Appendix-V and Appendix-VI gives detail in terms of definition, and source of the variables and also the details of the group of countries we used in this study.

3.6 Regression Results

3.6.1 Results from PMG Estimation and Robustness Check

As mentioned earlier, to examine the stationarity/non-stationarity of the dependent and independents variables, Fisher-type unit root test have been performed. We basically checked whether the variables of interest are (i) difference stationarity: first difference is stationary and/or (ii) trend stationarity: de-trended counterpart is stationary. In table 3-5 we found that though log GDP per capita, aid, remittances, domestic savings, literacy rate are not stationary at level, literacy rate is trend stationary and log GDP per capita, aid, remittances, and domestic savings are difference stationary. Since some of the variables are I(1), cointegration tests developed by Persyn & Westerlund (2008) have been performed. In table 3-6 we found evidence that there exists long run relationship between the regressand and all the regressors considered in the basic regression equation. We, therefore, proceed with the regression analysis using the DFE, MG, and PMG estimation techniques, the results are presented in table 3-1 and table 3-2. Initially, the results from the DFE estimation is presented and compared with the results obtained from MG estimation. Afterwards, the results from the PMG estimation is presented and compared with the results from MG estimation. Though one can present the estimates as a two equation model: the normalised cointegrating vector and the averaged short-run parameter estimates, here we have presented the former containing the long run parameters and the convergence coefficients. The long run coefficients are of particular
importance as it contains the long run relationship between the explained and the explanatory variables. Short-run dynamics are just used to control for cyclical fluctuations. In case of all three estimation techniques, the long-run homogeneity hypothesis allows the direct identification of the parameters that affect the steady-state path of output per capita. Under the assumption that the variables show a return to long run equilibrium, error correction coefficient is expected to be significantly negative. If the convergence coefficient is negative and less than unity in absolute value, there exists dynamically stable long run equilibrium. The difference in the magnitude of the speed of adjustment coefficients across the estimation techniques implies different short-run dynamics.

The lag order of ARDL model has to be long enough to make sure that the residuals are serially uncorrelated but not too long to cause a serious loss of degrees of freedom. The larger the number of variables in the regression, the smaller would be the number of lags allowed to be included. The optimal number of lags is chosen according to an information criterion such as Akaike Information Criterion (AIC) or the Schwarz Bayesian Criterion (SBC) where the choice of maximum lag length is dictated by the time series dimension in relation to the number of regressors in each panel. Considering the requirement by Gauss code for SBC, we were able to include 1 lag of the lagged dependent variable and potentially endogenous variables.²¹

Column-1 to column-3 of table 3-1 presents the regression results where we tried to fulfil the serially uncorrelated errors condition by choosing the ARDL (1111) model such that 1 lag of the dependent and potentially endogenous independent variables was imposed. Column-1 of table 3-1 shows that in case of DFE estimation, the convergence coefficient is negative (-0.10) and significant (at 1% level) implying about 10% of error correction in the single-period response of the GDP growth rate to departures from equilibrium.
This indicates a long-run relationship and feedback effects between the GDP growth rate and its fundamental determinants. While analysing the long run coefficients, we got evidence that remittances have significant effect in augmenting growth (at 1% level); a 1% increase in remittances will increase GDP growth by 0.06%. In contrast aid has significant deteriorating effect on growth. Among other control variables, we found FDI to exert significant positive effect on growth (at 1% level). Economic theory suggests that FDI results in a more efficient allocation of world savings, more inter-temporal consumption smoothing, and more risk reduction through asset diversification. Romer (1993) emphasized FDI’s role in diffusing technology and its relationship to economic growth. We also found that enhanced domestic savings exhibit a positive and significant correlation with GDP growth per capita (at 1% level). The coefficient on domestic saving is expected to be positive, since the higher the rate of savings of a country, the faster will be the capital accumulation and growth. The basic Solow-Swan growth model (1956) postulates a direct relationship between a country’s rate of savings and its output growth. We could also see that the increase in human capital and decrease in population growth significantly augment economic growth. Romer (1989) found positive effect of human capital on growth as countries having more human capital tend to have higher productivity. The Hausman test implies the validity of the homogeneity of slope coefficients and the efficiency of the DFE estimator over the MG estimator. Moreover, the Hausman test implies the validity of the long-run homogeneity restrictions on model’s parameters and the efficiency of the PMG estimator over the MG estimator. So, we can ignore the results from MG estimation.

In fact, we would focus on the results from PMG estimation since DFE estimator restricts all coefficients except the intercept to be equal across panel, whereas PMG provides efficiency gains by considering common long run relationship while allowing for heterogeneous short run dynamics across panel. The efficiency gains from PMG estimation of assuming common long-run relationship while at the same time allowing for heterogeneous short-run dynamics are very much relevant while dealing with GDP growth. It is expected that though the growth of GDP in the short-run are determined by the country-specific factors, the growth of GDP in the long-run is driven by the same fundamentals. In column-3 of table 3-1, the results from PMG estimation shows that the
convergence coefficient is negative and significant. As before, remittances are found to be supportive of GDP growth per capita. The PMG estimate of the remittance elasticity is larger in magnitude compared to the estimate from the DFE model, 0.06 compared to 0.13, implying that remittances are even more effective in enhancing growth. We found insignificant effect of aid on GDP growth per capita. We also found FDI, domestic savings and human capital to have growth enhancing effect, whereas population growth has growth worsening effect.

In column-1 to column-3 of table 3-2, we not only tried to fulfil the serially uncorrelated errors condition by choosing the ARDL model such that a lag structure (1 lag) of the lagged dependent and potentially endogenous independent variables was imposed, but also tried to control for contemporaneous correlation of regression errors by demeaning the data such that cross-section independence was imposed. Once again Hausman test is showing the efficiency of DFE and PMG estimator over MG estimator. Note that demeaning the data did not alter the results from DFE estimation. However, as before, we would focus on results of PMG estimator. In case of PMG estimation, the error correction coefficient is negative and significant (at 1% level). Remittances are found to exert significant effect in augmenting growth (at 1% level) suggesting that a doubling of migrants’ remittances raises the growth rate by 6%. In contrast, there is evidence of significant effect of aid in worsening growth (at 1% level). A 1% increase in aid will depress the GDP growth by 0.05%. As before, we found significant positive effect of FDI, domestic savings and human capital and significant negative effect of population growth on GDP growth per capita.\textsuperscript{22}

To sum, we found remittances as a more efficient source of external development finance compared to aid in stimulating growth. However, the significant negative coefficient of aid could be a result of omitted variable bias. Due to data limitation (i.e., problem of missing values), we could not include a number of variables frequently used in this line of literature.

\textsuperscript{22} As a robustness check, we also tried ADRL(2222) using the demeaned data and got qualitatively the same results for our variables of interest.
3.6.2 Results from GMM Estimation and Robustness Check

In this section, we used an alternative estimation technique, dynamic GMM, since it does not require strongly balanced panel and therefore, allowed us to control for other relevant variables that would potentially effect growth. Due to the reasons explained earlier, we applied the “System GMM” estimator and incorporated the longest possible lags of lagged dependent variable and other potentially endogenous variables as instruments. All other right hand side variables were assumed to be exogenous and instrumented with their own values.

Table 3-3 and table 3-4 presents the results from System GMM estimation. In column-1 of table 3-3, the basic regression model was augmented by an indicator of corruption, CPI (corruption perception index) and also by an interaction term aid*CPI. Adding interaction term increases the understanding of the relationships among the variables in the model and allows more hypotheses to be tested. The Hansen (1982) J-statistics (with a p value of 0.754), cannot reject the validity of the instruments. The Arellano and Bond (1991) test, AR(2) in first differences (with a p value of 0.11), accepts the hypothesis of no second order serial correlation in the error term. We could see that the convergence coefficient has the correct negative sign and is statistically significant.

The presence of a significant interaction indicates that the effect of aid on growth is different at different levels of corruption. Column-1 of table 3-3 shows that in the presence of the interaction term, the effect of aid on growth is 0.0090 – 0.0038*corruption. When corruption is fully controlled (i.e., when corruption = 0), the unique effect of aid on growth is positive, 0.0090, but insignificant. In Low and Middle

\[ \Delta \ln y_{it} = \alpha_0 - \phi \ln y_{i,t-1} + \alpha_1 \text{aid}_{i,t} + \alpha_2 FDI_{i,t} + \alpha_3 Rem_{i,t} + \alpha_4 GDS_{i,t} - \alpha_5 ln \frac{y_{i,t}}{y_{i,t-1}} + \alpha_6 \text{lnit}_{i,t} + \alpha_7 \text{CPI}_{i,t} + \alpha_8 \text{CPI}_{i,t} \ast \text{aid}_{i,t} + \epsilon_{i,t} \]

The unique effect of aid on growth would be \( \alpha_1 + \alpha_8 \ast \text{aid}_{i,t} \), and \( \alpha_7 \) can now be interpreted as the unique effect of aid on growth when corruption = 0. \( \alpha_7 \) is the effect of corruption when aid = 0. The effect of corruption is \( \alpha_7 + \alpha_8 \ast \text{aid}_{i,t} \).

The concept of conditional convergence has considerable explanatory power for economic growth across countries and regions. It implies that the lower the initial level of real per capita GDP of a country relative to its long run steady state position, the faster the growth rate.

---

23 We tried to estimate the basic regression equation using GMM estimation technique. We tried all possible combination of lags of instruments but in all cases the Hansen (1982) J-statistics rejected the null hypothesis of exogeneity of instruments.

24 Here we considered the regression model, \( \Delta \ln y_{i,t} = \alpha_0 - \phi \ln y_{i,t-1} + \alpha_1 \text{aid}_{i,t} + \alpha_2 FDI_{i,t} + \alpha_3 Rem_{i,t} + \alpha_4 GDS_{i,t} - \alpha_5 \ln \frac{y_{i,t}}{y_{i,t-1}} + \alpha_6 \text{lnit}_{i,t} + \alpha_7 \text{CPI}_{i,t} + \alpha_8 \text{CPI}_{i,t} \ast \text{aid}_{i,t} + \epsilon_{i,t} \). The unique effect of aid on growth would be \( \alpha_1 + \alpha_8 \ast \text{aid}_{i,t} \), and \( \alpha_7 \) can now be interpreted as the unique effect of aid on growth when corruption = 0. \( \alpha_7 \) is the effect of corruption when aid = 0. The effect of corruption is \( \alpha_7 + \alpha_8 \ast \text{aid}_{i,t} \).

25 The concept of conditional convergence has considerable explanatory power for economic growth across countries and regions. It implies that the lower the initial level of real per capita GDP of a country relative to its long run steady state position, the faster the growth rate.
income countries, the level of corruption is generally very high. If corruption = 10, for instance, the effect of aid is $0.0090 - 0.0038 \times 10 = -0.029$. The regression result also shows that remittances have significant positive impact on growth (at 1% level), a 1% increase in remittances would increase growth by 0.02%. Among other variables, we found that FDI and domestic savings are conducive to faster economic growth.

In column-2 and column-3 of table 3-4, we investigated whether our findings are sensitive to different variable specifications. In column-2 of table 3-4, an indicator of openness, trade, was included as an additional regressor. As before, remittances are found to exert significant positive effect on growth and aid interacted with corruption has significant negative effect on GDP growth per capita. When corruption is fully controlled, aid has positive but insignificant effect on growth. As before, FDI, and domestic savings are found to be supportive of growth. In column-3 of table 3-4, when the regression equation is further augmented by indicators of a country’s monetary policy (inflation and excess money growth), we got qualitatively the same result for our variables of interest. Moreover, we found excess money growth to have detrimental effect.

In table 3-4, we examined the robustness of our analysis by re-running the regression under alternative variable specification. Alternative measure of human capital, school enrollment, was used instead of adult literacy rate. In all specifications of table 3-4, the significance of conditional convergence effects was found, and the hypothesis of exogeneity of instruments and the hypothesis of no second order serial correlation were accepted. Again, we found robust evidence that remittances augment growth, aid interacted with corruption deteriorates growth, and insignificant unique effect of aid on GDP growth per capita. Among other control variables, FDI, domestic savings, and schooling are found to be supportive of faster economic growth; population growth, on the other hand, is associated with slower economic growth.

---

26 This potentially explains why in case of PMG estimation (table 3-2), we found aid to have adverse effect on growth.
To sum, the replacement or inclusion of variables in our model specifications does not alter our main findings. We argue that remittances have favourable impact on growth as it is more effective than foreign aid in enhancing capital accumulation. The theoretical model we presented in the next section will justify this.

3.7 A Theoretical Model on Aid and Remittances

The theoretical model we are going to present in this section is based on a dynamic general equilibrium model where capital accumulation is driven by foreign aid and international remittances. The model demonstrates that both foreign aid and remittances would potentially increase the amount of investment capital of the economy. However, in case of aid, the amount of capital accumulation is adversely affected if the economy is misgoverned and riddled with corruption. But, in case of remittances the amount of capital accumulation is comparatively higher since it flows directly to recipients. Existence of corruption cannot undermine the capital enhancing potential of remittances.

There are in fact a few theoretical papers that analyses the effects of foreign aid on the economy in the presence of corruption. Svensson (2000) investigated why the performance of aid is so poor. He used a game-theoretic model of rent-seeking behaviour among different groups of agents competing over a pool of government resources. He found that though rent-seeking is costly and all groups would be better off if they abstained from it and cooperated, each group has an incentive to deviate from cooperation unless the donor community can enter into a binding policy commitment and sufficient penalties can be imposed. He found that there exists a critical level of government resources, below which cooperation is sustained and above which rent-seeking occurs. He argued that a windfall of foreign aid might be counter-productive if the level of resources is already close to its critical value. Hodler (2007) and Economides et al. (2008) integrate corruption into the endogenous growth model developed by Barro (1990). They introduced corruption by considering that agents allocate their time between productive growth-promoting activities and non-productive resource-extracting activities. They showed how foreign aid has both a beneficial effect on growth by enlarging public expenditures and a deteriorating effect on growth by generating a
The latter is likely to dominate as the volume of aid increases implying that the net result is an inverted U-shape relationship between aid and growth. Blackburn and Forgues-Puccio (2011) present an analysis of the effects of foreign aid on economic development. According to them, corruption holds back economic development and reduces the effectiveness of aid programmes. They showed that level of corruption is affected by both the development process and the volume of aid. They found foreign aid to support development when governance is good, but retard development when governance is bad and therefore, corruption and poverty can co-exist as permanent features of an economy. There is in fact no theoretical paper that that deals with the comparative strength of foreign aid and remittances in the evolution of capital accumulation and growth of an economy. In this study, we explore the dynamic general equilibrium interactions between capital accumulation, foreign aid and remittances to identify the potential of these external sources of income in accelerating growth and development of the recipient economy.

3.7.1 The Basic Framework

In the present analysis we consider an economy in which there is a constant population of two-period-lived agents belonging to overlapping generations of dynastic families. Agents of each generation are either private individuals (households) or public servants (bureaucrats). Households work for firms in the production of output, while government-appointed bureaucrats administer public policy. Households are differentiated according to differences in their incomes and bureaucrats are differentiated according to differences in their inclination towards corruption. The corrupt bureaucrats embezzle public funds which are otherwise used to provide subsidies to poor households.

3.7.1.1 The Private Sector

Households

Among the agents, there are $m$ population of private individuals (households). The population of household is divided into a fraction $\mu \in (0,1)$ of high skilled high-income households, endowed with 1 unit of labour; and a remaining fraction $(1 - \mu)$ of low
skilled low-income households, endowed with \( \lambda < 1 \) units of labour. The Low-income households receive subsidies from the government.

We consider that each household has two children: one child sent abroad, one child stays at home. They derive linear utility from old-age consumption. Consumption is financed from savings (income) when young. In case of high-income households, income when young is equal to wage earnings, \( w_t \). All income is saved and invested in capital at the interest rate \( i_{t+1} \). Therefore, high-income households’ income when old is \((1 + i_{t+1})w_t\). Amount of savings available for capital is \( r_{h8} \). On the other hand, low-income households receive subsidies from the Government. In case of low income households, income when young is equal to wage earnings, \( \lambda w_t \), plus subsidies, \( \sigma_t \). All income is invested in capital at the interest rate \( i_{t+1} \). Thus, income of low income household when old equals \((1 + i_{t+1})(\lambda w_t + \sigma_t)\). Amount of savings available for capital is \( r_{h8} \).

**Firms**

There are unit mass of firms operating in perfectly competitive markets. Firms hire labour from households and rent capital from all agents. Firms produce output, \( y_t \), using labour, \( l_t \), and capital, \( k_t \). The production function is Cobb Douglas type, \( y_t = \alpha l_t^a k_t^{1-a} \). Firms are subject to a proportional output tax, \( \tau \in (0; 1) \). Firm’s objective is to maximise profit, \( \pi_t = (1 - \tau) \alpha l_t^a k_t^{1-a} - w_t l_t - i_t k_t \). Let \( l \) denote the (constant) equilibrium level of employment equal to the total labour supply of households. The value of this is \([\mu + (1 - \mu)\lambda]m\). The equilibrium wage can be calculated as follows

\[
\frac{d\pi_t}{dl_t} = (1 - \tau) \alpha l_t^{a-1} k_t^{1-a} - W_t = 0 \\
\Rightarrow w_t = (1 - \tau) \alpha l^{-1} a l^{1-a} , \text{where } \alpha l^a = a 
\]

\[(3.12)\]

**3.7.1.2 The Public Sector**

**Bureaucrats Preferences, Income and Savings**

The government hires bureaucrats to implement public policy. Bureaucrats are classified according to differences in their inclination towards corruption. The corrupt bureaucrats embezzle public funds which are otherwise used to increase fortunes of low income
households. Among the agents, there are \( n \) population of public officials (bureaucrats). The population of bureaucrats is divided into a fraction \( \eta \in (0,1) \) of corrupt and a remaining fraction \( (1 - \eta) \) of non-corrupt bureaucrats. Each bureaucrat supplies one unit of labour to the government, each of them has one child.

The identity of a bureaucrat is private information. A non-corruptible bureaucrat always behaves honestly, whereas a corruptible bureaucrat would abuse his powers and must undertake certain actions in order to avoid detection by the authorities. Usually, corrupt individuals try to remain unidentified in a number of ways, such as hiding their illegal income, investing this income in a different way from legal income and changing their patterns of expenditure. Such actions naturally entail costs in one form or another. In the present analysis, we consider the following simple scenario, based on Blackburn and Sarmah (2008). A corruptible bureaucrat can escape immediate detection by storing his illegal income in hiding (instead of investing it in capital) and by imitating the behaviour of a non-corrupt bureaucrat (rather than risking noticeable consumption). He can avoid subsequent arrest by taking flight with his wealth and consuming in secrecy elsewhere.

As households, each bureaucrat derives linear utility from old-age consumption. Consumption is financed from savings (income) when young. In case of non-corrupt bureaucrats, income and savings are same as high income households, i.e., income when young is equal to wage earnings, \( w_t \), income when old is \( (1 + i_{t+1})w_t \). Amount of savings available for capital is \( w_t \). But, in case of corrupt bureaucrat, income when young is equal to wage earnings, \( w_t \), plus any public funds that are stolen, \( p_t \). Though the bureaucrats steal public funds, they don’t invest these in order to evade immediate detection. Only legal income is invested in capital at the interest rate \( i_{t+1} \). Illegal income must be hidden. Therefore, income when old is \( (1 + i_{t+1})w_t + p_t \). Amount of savings available for capital is \( w_t \).

**Government**

Public policy is a programme of taxes on firms and subsidies to low income households. The reason behind disbursement of subsidies by the government is to foster growth and reduce inequality by generating additional productivity of low income households. The
bureaucrats, who distribute public funds, some of them may be tempted to be engaged in corruption by embezzling such government provision.

Bureaucrats have the opportunity to work for firms and earn a wage equal to the wage received by high income households. If the government offered a wage less than this, only corrupt bureaucrats would accept the job (since they can compensate themselves from misappropriation) and all public funds would be stolen, implying zero subsidies. The government therefore sets the minimum possible wage which ensures participation of non-corrupt bureaucrats. Similar to Acemoglu and Verdier 1998; Blackburn et al. 2006; Blackburn and Forgues-Puccio 2007, we assume that a corrupt bureaucrat is subject to the maximum fine of having all of his income seized if discovered. No corruptible bureaucrat would ever reveal himself in this way.

Government’s total revenue from taxes is \( \tau Al^{\alpha}k_t^{1-\alpha} = \tau ak_t^{1-\alpha} \), out of which \( nw_t \) is spent as the salaries of bureaucrats. Therefore, the amount of public funds available for distribution is

\[
P_t = \tau ak_t^{1-\alpha} - nw_t = \Pi ak_t^{1-\alpha} \quad \text{where} \quad \Pi = [ \tau - n(1 - \tau)al^{-1} ]
\]

(3.13)

Each bureaucrat is allocated \( p_t = \frac{p_t}{n} \) amount of public funds to allocate as subsidies to low income households. Such government delegation might result in corruption. Given that \( \eta n \) bureaucrats pocket public funds for themselves, the actual amount of public funds available for disbursement as subsidies is

\[
P_t - \eta P_t = (1 - \eta) P_t = (1 - \eta) \Pi ak_t^{1-\alpha}
\]

(3.14)

If the government continuously runs a balanced budget, the total amount of subsidies given to low-income households is \( m(1 - \mu)\sigma_t \). The government’s budget constraint implies

\[
m(1 - \mu)\sigma_t = (1 - \eta) P_t = (1 - \eta) \Pi ak_t^{1-\alpha}
\]

(3.15)

The Aggregate Outcome

The last part in our description of the economy is the dynamic path of capital accumulation - the process by which development takes place. The equilibrium condition
implies that the total demand for capital by firms, \( k_{t+1} \), is equal to the total supply of capital by agents. The total supply of capital equals the savings of households, plus the savings (of legal income) of bureaucrats. Thus, we get

\[
k_{t+1} = m \mu w_t + m(1-\mu)(\delta w_t + \sigma_t) + nw_t = [(1-\tau)\alpha + \tau - \eta \Pi]ak_t^{1-a}
\]  

(3.16)

The steady state implies \( k_{t+1} = k_t \). The steady state level of capital,

\[
\bar{k} = \left[\left((1-\tau)\alpha + \tau - \eta \Pi\right)a\right]^{\frac{1}{a}}
\]  

(3.17)

Fig 3-4 shows that the effect of corruption is to reduce capital accumulation from \( \kappa_{t}^{**} \) to \( \kappa_{t}^{*} \). The way that corruption takes effect on the economy is through the appearance of \( \eta \), fraction of corrupt bureaucrats in equation (3.16). Corruption has a negative impact on the evolution of capital since in the presence of corruption low-income households receive less subsidies and therefore save less.

In the following section we determine the aggregate outcomes in the economy under various scenarios which differ according to the presence or absence of foreign aid, and the presence or absence of remittances.

### 3.7.2 An Economy with Aid

One of our main interests is to see how foreign aid participates in the evolution of capital, and thus affect the course of a country’s growth and development. To study this, we consider the case in which our model economy is injected with aids from overseas. These additional funds are targeted towards subsidies to low income households. In this case, production function, firm’s profit, equilibrium wage, government’s revenue remain as before. But, aid inflow, \( f_t \), increases the volume of public fund available for subsidy after paying bureaucrats’ salaries; it will be increased compared to the standard case when there is no aid inflow. Now the public funds available for disbursement as subsidies is

\[
P_t = \tau ak_t^{1-a} - nw_t + f_t = \Pi ak_t^{1-a} + f_t
\]  

(3.18)
where, $n = [ \tau - (1 - \tau)\alpha t^{-1} n ]$. In the presence of corruption, a fraction of public funds will be misappropriated by the corrupt bureaucrat. Therefore, the actual amount of public funds available for disbursement as subsidies will be

$$P_t - \eta P_t = (1 - \eta) P_t = (1 - \eta) [\Pi ak_t^{1-a} + f_t] \quad (3.19)$$

Now the total amount of subsidies given to low-income households is $m(1 - \mu)\sigma_t$ and the government’s budget constraint will be

$$m(1 - \mu)\sigma_t = (1 - \eta)[\Pi ak_t^{1-a} + f_t] \quad (3.20)$$

The capital accumulation is described by

$$k_{t+1} = m\mu w_t + m(1 - \mu)(\lambda w_t + \sigma_t) + nw_t$$

$$\Rightarrow k_{t+1} = [(1 - \tau)\alpha + \tau - \eta\Pi]ak_t^{1-a} + (1 - \eta)f_t \quad (3.21)$$

Thus corruption depresses the evolution of capital, it only allows a fraction of aid to be accumulated as capital. The change in capital accumulation due to aid inflow can be obtained by first order differentiation

$$\frac{dk_{t+1}}{df_t} = (1 - \eta) \quad (3.22)$$

It implies that the higher the incidence of corruption, the smaller would be the augmentation of capital resulting from such additional international transfer of funds. Therefore, governance and corruption can be very crucial in determining the merits of aid programmes. In the absence of corruption, the potential of these aid programmes could be fully realised. Existence of corruption implies that this potential could be seriously compromised.

### 3.7.3 An Economy with Remittances

As explained earlier, remittances augment domestic residents’ income (savings) so that high-income households get $w_t + r_t$ and low-income households get $\lambda w_t + \sigma_t + r_t$. Now we will analyse how remittances might affect capital accumulation and long-run development of an economy. In this case, the production function, equilibrium wage,
government’s revenue, amount of public funds available for disbursement as subsidies, and the government’s budget constraint will be same as in the benchmark case. The only change will be in the magnitude of capital accumulation. Remittances will augment the capital accumulation as follows

\[
k_{t+1} = m\mu(w_t + r_t) + m(1 - \mu) (\lambda w_t + \sigma_t + r_t) + nw_t
\]

\[
\Rightarrow k_{t+1} = [(1 - \tau)\alpha + \tau - \eta I]ak_t^{1-\alpha} + mr_t
\]  (3.23)

Thus corruption continues to depress the evolution of capital. But it does not necessarily reduce the amount of remittances available to augment capital accumulation. The change in capital accumulation due to remittance inflows can be obtained by first order differentiation

\[
\frac{dk_{t+1}}{dmr_t} = 1
\]  (3.24)

Thus, even in the presence of corruption, the potential of international remittances in augmenting capital accumulation and thus growth and development can be fully realised.

To sum, our theoretical model shows that foreign aid increases the amount of investment capital of the economy by increasing the quantity of subsidies given to the poor households by the government. In case of remittances, the amount of capital accumulation is even higher since remittances flow directly to recipients whilst aid is channelled through public institutions that suffer from corruption.

### 3.8 Concluding Remarks

In Low and Middle Income Countries, large migration flows have introduced remittances as one of the most important source of external finance. These countries are at the same time recipients of foreign aid. Therefore, the Low and Middle Income Countries could be very interesting for analysing the relative effectiveness of aid and remittances. The Middle Income Countries, which are more dependent on remittances, are experiencing a relatively higher growth of GDP per capita over the years. In contrast, the Low Income Countries, which are more dependent on aid, are lagging behind. These raise the question
about the role of these external finances. In this chapter we investigated whether less
dependence on foreign aid and more dependence on enhanced remittance earnings could
better accelerate capital accumulation and growth of recipient countries. We worked with
a robustly specified empirical growth model that incorporates recent advances in growth
theory. Model specification took into account all the major sources of external finance –
of official development assistance and official aid (ODA), FDI, remittances. We applied
two different estimation techniques PMG and GMM estimation.

PMG effectively deals with large N and large T nonstationary heterogeneous dynamic
panels. But since it requires strongly balanced panel, we could not consider a number of
Low and Middle income countries due to the problem of missing values in the panel
data. In case of PMG estimation, our final sample includes 42 Low & Middle Income
Countries; these countries were randomly selected on the basis that they have at least
90% data for each variable included in the regression. The data is annual and covers the
period 1981-2008. Estimation is based on an error-correction auto-regressive distributive
lag (ARDL) model. Along with the traditional DFE estimator, recently developed MG,
and PMG estimator were used. These estimators estimate the error correction version of
the dynamic growth model directly and account for the empirically proven endogeneity
between GDP growth and some forms of capital inflows. Before doing the regression
analysis we checked for stationarity and cointegration. The convergence coefficient is
significantly negative in case of all three estimation techniques implying that there exists
dynamically stable long run equilibrium. We found evidence of quite the opposite effect
of these two forms of external capital on growth; foreign aid has detrimental effect
whereas international remittances have favourable impact.

We also applied an alternative estimation technique, dynamic GMM, since it does not
require strongly balanced panel and thus allowed us to include other variables expected
to influence growth. In the case of GMM estimation, the base line sample includes 143
Low and Middle Income Countries over the period 1981-2008. We used System-GMM
which has better finite sample properties and effectively deals with endogeneity and non-
stationarity issues. The replacement or inclusion of variables in the regression model did
not alter our main findings. We found significance of conditional convergence effects in
all specification. We found robust evidence that remittances enhance growth and in the presence of high corruption, aid deteriorates growth. In the theoretical model presented at the end of this chapter, we found that existence of corruption do not undermine the capital enhancing potential of remittances; but in the presence of corruption, the capital enhancing potential of aid could be seriously compromised. In the absence of corruption that the capital enhancing potential of aid could be fully realised. However, in the empirics, when corruption was controlled, we did not find any significant effect of aid on growth. Therefore, control of corruption could increase the amount of capital accumulated from aid, but control of corruption may not be enough to make aid work for growth.

Unobserved time-specific heterogeneity is a concern in the estimation of panel data models using macroeconomic data. Such heterogeneity arises due to common global shocks affecting economically and financially integrated countries. Global shocks could affect all the countries in the same way or in possibly very different ways or to varying degrees; in either case, there will be cross-section dependence in the errors of cross-section units. Characterizing and modelling error cross-section dependence has been difficult and therefore very limited (Phillips and Moon, 1999). Usually, either cross-sectional independence is assumed (e.g., PMG estimation), or cross-section in dependence is imposed by cross-sectionally demeaning model’s variables. In the latter, it is implicitly assumed that the unobserved factors affect all panel members in the same way, so that demeaning completely removes their effect. However, if this is not the case, such demeaning will reduce, but not completely remove, the common time-specific effects (Pesaran et al., 1999). Finally, a word of caution is necessary with respect to the measure of foreign assistance and aid which includes concessional loans, grants, food aid, technological aid, etc. Clearly there is ground for disaggregating aid to examine whether certain forms of aid is preferable from the point of view of growth and whether some aid is better than no aid. However, such disaggregated aid data for most of the developing countries is still unavailable and could be subject of future research.
Figure 3-1 Low and Middle Income Countries  (i) GDP Growth (ii) Capital Flows at Level and (iii) Capital Flows as Share of GDP (iv) Annual % Growth of Capital Flows and  (v) Volatility of Capital Flows

(i)

(ii)

(iii)

(iv)

(v)

Source: Author’s calculation using data from WDI (world development indicators, 2009)
Figure 3-2 Middle Income Countries - (i) GDP Growth (ii) Capital Flows at Level and (iii) Capital Flows as Share of GDP (iv) Annual % Growth of Capital Flows and (v) Volatility of Capital Flows

(i)

(ii)

(iii)

(iv)

(v)

Source: Author’s calculation using data from WDI (world development indicators, 2009)
Figure 3-3 Low Income Countries - (i) GDP Growth (ii) Capital Flows at Level and (iii) Capital Flows as Share of GDP (iv) Annual % Growth of Capital Flows and (v) Volatility of Capital Flows

(i) 

(ii) 

(iii) 

(iv) 

(v) 

Source: Author’s calculation using data from WDI (world development indicators, 2009)
Table 3-1 Estimation of Nonstationary Heterogeneous Panels (Basic Model with Lags)

<table>
<thead>
<tr>
<th>A Log of GDP per capita</th>
<th>[1]</th>
<th>[2]</th>
<th>[3]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DFE</td>
<td>MGE</td>
<td>PMGE</td>
</tr>
<tr>
<td>AID</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.0119</td>
<td>0.2604</td>
<td>0.0008</td>
</tr>
<tr>
<td></td>
<td>(0.0108)</td>
<td>(0.2357)</td>
<td>(0.0081)</td>
</tr>
<tr>
<td>FDI</td>
<td>0.0397***</td>
<td>0.0252</td>
<td>0.0976***</td>
</tr>
<tr>
<td></td>
<td>(0.0174)</td>
<td>(0.0923)</td>
<td>(0.0133)</td>
</tr>
<tr>
<td>REM</td>
<td>0.0592***</td>
<td>0.2606</td>
<td>0.1315***</td>
</tr>
<tr>
<td></td>
<td>(0.0168)</td>
<td>(0.2132)</td>
<td>(0.0180)</td>
</tr>
<tr>
<td>GDS</td>
<td>0.0340***</td>
<td>-0.0026</td>
<td>0.0469***</td>
</tr>
<tr>
<td></td>
<td>(0.0111)</td>
<td>(0.0106)</td>
<td>(0.0070)</td>
</tr>
<tr>
<td>ALR</td>
<td>0.0575***</td>
<td>0.0821</td>
<td>0.0804***</td>
</tr>
<tr>
<td></td>
<td>(0.0089)</td>
<td>(0.0348)</td>
<td>(0.0071)</td>
</tr>
<tr>
<td>PGR</td>
<td>-0.1223***</td>
<td>1.0099*</td>
<td>-0.0387</td>
</tr>
<tr>
<td></td>
<td>(0.0518)</td>
<td>(0.5995)</td>
<td>(0.0320)</td>
</tr>
<tr>
<td>Error Correction</td>
<td>-0.1002***</td>
<td>-0.4365***</td>
<td>-0.1026***</td>
</tr>
<tr>
<td></td>
<td>(0.0154)</td>
<td>(0.0922)</td>
<td>(0.0192)</td>
</tr>
</tbody>
</table>

Hausman Test

chi2(6) = 0.00  
Prob=chi2 = 1.000

chi2(6) = 0.51  
Prob=chi2 = 0.9977

Notes: All equations include a constant country-specific term. Numbers reported in parentheses are robust standard errors. ***, **, and * indicate significance respectively at the 1%, 5%, and 10% levels. Error correction term is negative and significant at all specifications implying there exists dynamically stable long run equilibrium. The null hypothesis of the Hausman Test, Ho: difference in coefficients not systematic has been accepted in all cases implying that DFE estimator is more efficient compared to MG estimator and PMG estimator is more efficient compared to MG. The sigmamore option of the hausman test has been offered that forces the variance-covariance matrix from the efficient model to be used in calculating the test statistic. GDP is ∆log GDP per capita, GDP_{t-1} is the log of Lagged GDP per capita, AID is the ratio of net official development assistance and official aid received to GDP, FDI is the ratio of FDI net inflow to GDP, REM is the ratio of remittance receipts to GDP, GDS is the ratio of gross domestic saving to GDP, ALR is the adult literacy rate (% of people ages 15 and above), PGR is The population growth rate, TRADE is the ratio of trade to GDP.
### Table 3-2 Estimation of Nonstationary Heterogeneous Panels (Basic Model with Demeaned Data and Lags)

Number of years, T = 28  
Number of groups, N = 42  
Number of observations = 1085  
Observation per group: min = 24, max = 26

Cross-sectionally demeaned data (ADRL 1,1,1,1,0,0,0,0)

<table>
<thead>
<tr>
<th>Δ Log of GDP per capita</th>
<th>DFE</th>
<th>MGE</th>
<th>PMGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>AID</td>
<td>-0.0119 (0.0108)</td>
<td>0.2933 (0.2368)</td>
<td>-0.0544*** (0.0062)</td>
</tr>
<tr>
<td>FDI</td>
<td>0.0397*** (0.0174)</td>
<td>0.0875 (0.0666)</td>
<td>0.0985*** (0.0121)</td>
</tr>
<tr>
<td>REM</td>
<td>0.0592*** (0.0168)</td>
<td>0.1887 (0.1889)</td>
<td>0.0654*** (0.0134)</td>
</tr>
<tr>
<td>GDS</td>
<td>0.0340*** (0.0111)</td>
<td>0.0010 (0.0116)</td>
<td>0.0190*** (0.0054)</td>
</tr>
<tr>
<td>ALR</td>
<td>0.0575*** (0.0089)</td>
<td>0.0677 (0.0442)</td>
<td>0.0603*** (0.0045)</td>
</tr>
<tr>
<td>PGR</td>
<td>-0.1223*** (0.0518)</td>
<td>1.0802* (0.0671)</td>
<td>-0.1089*** (0.0165)</td>
</tr>
<tr>
<td>Error Correction</td>
<td>-0.1002*** (0.0154)</td>
<td>-0.4396*** (0.0925)</td>
<td>-0.1214*** (0.0231)</td>
</tr>
</tbody>
</table>

Hausman Test  

<table>
<thead>
<tr>
<th>chi²(6) = 0.00</th>
<th>chi²(6) = 0.13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prob&gt;chi² = 1.00</td>
<td>Prob&gt;chi² = 1.00</td>
</tr>
</tbody>
</table>

Notes: All equations include a constant country-specific term. Numbers reported in parentheses are robust standard errors. ***, **, and * indicate significance respectively at the 1%, 5%, and 10% levels. Error correction term is negative and significant at all specifications implying there exists dynamically stable long run equilibrium. The null hypothesis of the Hausman Test, Ho: difference in coefficients not systematic has been accepted in all cases implying that DFE estimator is more efficient compared to MG estimator and PMG estimator is more efficient compared to MG. The sigmamore option of the hausman test has been offered that forces the variance-covariance matrix from the efficient model to be used in calculating the test statistic. GDP is Δlog GDP per capita, GDPt-1 is the log of Lagged GDP per capita, AID is the ratio of net official development assistance and official aid received to GDP, FDI is the ratio of FDI net inflow to GDP, REM is the ratio of remittance receipts to GDP, GDS is the ratio of gross domestic saving to GDP, ALR is the adult literacy rate (% of people ages 15 and above), PGR is The population growth rate, TRADE is the ratio of trade to GDP.
Table 3-3 System GMM Estimation (Basic Model Augmented with a Number of Variables)

<table>
<thead>
<tr>
<th></th>
<th>[1]</th>
<th>[2]</th>
<th>[3]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δlngdppc</td>
<td>-0.1119***</td>
<td>-0.1034***</td>
<td>-0.0929***</td>
</tr>
<tr>
<td></td>
<td>(0.0434)</td>
<td>(0.0391)</td>
<td>(0.0436)</td>
</tr>
<tr>
<td>lngdpp,-1</td>
<td>0.0009</td>
<td>0.0005</td>
<td>0.0007</td>
</tr>
<tr>
<td></td>
<td>(0.0092)</td>
<td>(0.0080)</td>
<td>(0.0079)</td>
</tr>
<tr>
<td>AID</td>
<td>0.0319*</td>
<td>0.0269*</td>
<td>0.0291**</td>
</tr>
<tr>
<td></td>
<td>(0.0179)</td>
<td>(0.0155)</td>
<td>(0.0148)</td>
</tr>
<tr>
<td>FDI</td>
<td>0.0161****</td>
<td>0.0164****</td>
<td>0.0169****</td>
</tr>
<tr>
<td></td>
<td>(0.0053)</td>
<td>(0.0058)</td>
<td>(0.0058)</td>
</tr>
<tr>
<td>REM</td>
<td>0.0100***</td>
<td>0.0094***</td>
<td>0.0102***</td>
</tr>
<tr>
<td></td>
<td>(0.0028)</td>
<td>(0.0030)</td>
<td>(0.0026)</td>
</tr>
<tr>
<td>POP</td>
<td>-0.0176</td>
<td>-0.0212</td>
<td>-0.0166</td>
</tr>
<tr>
<td></td>
<td>(0.0255)</td>
<td>(0.0240)</td>
<td>(0.0241)</td>
</tr>
<tr>
<td>LIT</td>
<td>0.0019</td>
<td>0.0020</td>
<td>0.0017</td>
</tr>
<tr>
<td></td>
<td>(0.0014)</td>
<td>(0.0014)</td>
<td>(0.0015)</td>
</tr>
<tr>
<td>TRADE</td>
<td>-0.0004</td>
<td>0.0001</td>
<td>0.0006</td>
</tr>
<tr>
<td></td>
<td>(0.0008)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M2</td>
<td>0.0176***</td>
<td>0.0169****</td>
<td>0.0169****</td>
</tr>
<tr>
<td></td>
<td>(0.0007)</td>
<td>(0.0006)</td>
<td>(0.0006)</td>
</tr>
<tr>
<td>INF</td>
<td>0.0000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0001)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPI</td>
<td>0.0056</td>
<td>0.0038</td>
<td>0.0042</td>
</tr>
<tr>
<td></td>
<td>(0.0123)</td>
<td>(0.0115)</td>
<td>(0.0121)</td>
</tr>
<tr>
<td>CPI*AID</td>
<td>-0.0038*</td>
<td>-0.0039*</td>
<td>-0.0034*</td>
</tr>
<tr>
<td></td>
<td>(0.0023)</td>
<td>(0.0021)</td>
<td>(0.0020)</td>
</tr>
<tr>
<td>_cons</td>
<td>0.5416</td>
<td>0.5365</td>
<td>0.5066</td>
</tr>
<tr>
<td></td>
<td>(0.2619)</td>
<td>(0.2529)</td>
<td>(0.2587)</td>
</tr>
<tr>
<td>Countries/Observation</td>
<td>103/300</td>
<td>103/299</td>
<td>103/299</td>
</tr>
<tr>
<td>No of instruments</td>
<td>100</td>
<td>101</td>
<td>103</td>
</tr>
<tr>
<td>Wald test</td>
<td>χ²(9)=72.67,</td>
<td>χ²(10)=75.15,</td>
<td>χ²(12)=89.77,</td>
</tr>
<tr>
<td></td>
<td>Prob&gt;χ²=0.0</td>
<td>Prob&gt;χ²=0.0</td>
<td>Prob&gt;χ²=0.0</td>
</tr>
<tr>
<td>Hansen-j statistics (p value)</td>
<td>0.754</td>
<td>0.106</td>
<td>0.113</td>
</tr>
<tr>
<td>AR(2) test (p value)</td>
<td>0.110</td>
<td>0.176</td>
<td>0.832</td>
</tr>
</tbody>
</table>

Notes: Numbers reported in parentheses are robust standard errors. ***, **, and * indicate significance respectively at the 1%, 5%, and 10% levels. The longest possible lags, i.e., (2, 5) lags of lagged dependent variable and other potentially endogenous variables were included as instruments.
Table 3-4 System GMM Estimation (Basic Model Augmented with a Number of Variables and Alternative Measure of Human Capital)

<table>
<thead>
<tr>
<th>∆lngdppc</th>
<th>[1]</th>
<th>[2]</th>
<th>[3]</th>
</tr>
</thead>
<tbody>
<tr>
<td>lngdpp_{t-1}</td>
<td>-0.1422***</td>
<td>-0.1430***</td>
<td>-0.1343***</td>
</tr>
<tr>
<td></td>
<td>(0.0440)</td>
<td>(0.0486)</td>
<td>(0.0520)</td>
</tr>
<tr>
<td>AID</td>
<td>0.0112</td>
<td>0.0122</td>
<td>0.0116</td>
</tr>
<tr>
<td></td>
<td>(0.0110)</td>
<td>(0.0103)</td>
<td>(0.0102)</td>
</tr>
<tr>
<td>FDI</td>
<td>0.0303**</td>
<td>0.0272*</td>
<td>0.0269*</td>
</tr>
<tr>
<td></td>
<td>(0.0144)</td>
<td>(0.0141)</td>
<td>(0.0142)</td>
</tr>
<tr>
<td>REM</td>
<td>0.0188***</td>
<td>0.0196***</td>
<td>0.0211***</td>
</tr>
<tr>
<td></td>
<td>(0.0065)</td>
<td>(0.0070)</td>
<td>(0.0068)</td>
</tr>
<tr>
<td>GDS</td>
<td>0.0102***</td>
<td>0.0100***</td>
<td>0.0102***</td>
</tr>
<tr>
<td></td>
<td>(0.0032)</td>
<td>(0.0035)</td>
<td>(0.0033)</td>
</tr>
<tr>
<td>POP</td>
<td>-0.0416</td>
<td>-0.0490**</td>
<td>-0.0455*</td>
</tr>
<tr>
<td></td>
<td>(0.0264)</td>
<td>(0.0241)</td>
<td>(0.0251)</td>
</tr>
<tr>
<td>SCHOOL</td>
<td>0.0025*</td>
<td>0.0024*</td>
<td>0.0023*</td>
</tr>
<tr>
<td></td>
<td>(0.0013)</td>
<td>(0.0012)</td>
<td>(0.0013)</td>
</tr>
<tr>
<td>TRADE</td>
<td>-0.0001</td>
<td>0.0002</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0008)</td>
<td>(0.0008)</td>
<td></td>
</tr>
<tr>
<td>M2</td>
<td></td>
<td></td>
<td>-0.0011</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.0007)</td>
</tr>
<tr>
<td>INF</td>
<td></td>
<td></td>
<td>0.0000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.0001)</td>
</tr>
<tr>
<td>CPI</td>
<td>0.0079</td>
<td>0.0092</td>
<td>0.0104</td>
</tr>
<tr>
<td></td>
<td>(0.0133)</td>
<td>(0.0135)</td>
<td>(0.0135)</td>
</tr>
<tr>
<td>CPI*AID</td>
<td>-0.0047*</td>
<td>-0.0049**</td>
<td>-0.0048**</td>
</tr>
<tr>
<td></td>
<td>(0.0025)</td>
<td>(0.0024)</td>
<td>(0.0023)</td>
</tr>
<tr>
<td>cons</td>
<td>0.6725</td>
<td>0.7133</td>
<td>0.6676</td>
</tr>
<tr>
<td></td>
<td>(0.2593)</td>
<td>(0.2911)</td>
<td>(0.3035)</td>
</tr>
<tr>
<td>Countries/Observation</td>
<td>110/300</td>
<td>110/298</td>
<td>110/298</td>
</tr>
<tr>
<td>No of instruments</td>
<td>105</td>
<td>106</td>
<td>108</td>
</tr>
<tr>
<td>Wald test</td>
<td>chi^2 (9)=86.44, Prob&gt; chi^2=0.0</td>
<td>chi^2 (10)=98.91, Prob&gt; chi^2=0.0</td>
<td>chi^2 (12)=105.53, Prob&gt; chi^2=0.0</td>
</tr>
<tr>
<td>Hansen-j statistics(p value)</td>
<td>0.868</td>
<td>0.883</td>
<td>0.901</td>
</tr>
<tr>
<td>AR(2) test (p value)</td>
<td>0.130</td>
<td>0.134</td>
<td>0.140</td>
</tr>
</tbody>
</table>

Notes: Numbers reported in parentheses are robust standard errors. ***, **, and * indicate significance respectively at the 1%, 5%, and 10% levels. The longest possible lags, i.e., (2 .) lags of lagged dependent variable and other potentially endogenous variables were included as instruments.
Figure 3-4 Effect of Corruption

\[ K_{t+1} \]

\[ \eta = 0 \]

\[ \eta > 0 \]

\[ K_t^* \]

\[ K_t^{**} \]

\[ K_t \]
Table 3-5 Unit-root Test - Fisher-type (Augmented Dickey-Fuller)

Ho: All panels contain unit roots, Ha: At least one panel is stationary  Number of panels and periods = 42 and 28 (level), 27(first differenced)  ADF regressions: 1 lag

<table>
<thead>
<tr>
<th>Variable</th>
<th>Level</th>
<th>First differenced</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Panel means Included</td>
<td>Panel means &amp; time trend: included</td>
</tr>
<tr>
<td></td>
<td>Time trend: Not included</td>
<td>Cross-sectional means removed</td>
</tr>
<tr>
<td>LOGGDPPC</td>
<td>P 25.7401 1.000</td>
<td>P 81.324 0.5624</td>
</tr>
<tr>
<td></td>
<td>Z 8.2272 1.000</td>
<td>Z -0.2125 0.4159</td>
</tr>
<tr>
<td></td>
<td>L 8.6301 1.000</td>
<td>L -0.3 0.3822</td>
</tr>
<tr>
<td></td>
<td>Pm -4.4949 1.000</td>
<td>Pm -0.2065 0.5818</td>
</tr>
<tr>
<td>AID</td>
<td>P 100.033 0.1119</td>
<td>P 114.5582 0.015</td>
</tr>
<tr>
<td></td>
<td>Z -1.7958 0.0363</td>
<td>Z -0.826 0.2044</td>
</tr>
<tr>
<td></td>
<td>L -1.7735 0.0388</td>
<td>L -1.4015 0.0813</td>
</tr>
<tr>
<td></td>
<td>Pm 1.237 0.108</td>
<td>Pm 2.3576 0.0092</td>
</tr>
<tr>
<td>FDI</td>
<td>P 127.0336 0.0007</td>
<td>P 162.6758 0.000</td>
</tr>
<tr>
<td></td>
<td>Z -2.4302 0.0075</td>
<td>Z -3.8242 0.000</td>
</tr>
<tr>
<td></td>
<td>L -2.5598 0.0056</td>
<td>L -4.3645 0.000</td>
</tr>
<tr>
<td></td>
<td>Pm 3.3201 0.0004</td>
<td>Pm 6.07 0.000</td>
</tr>
<tr>
<td>REM</td>
<td>P 64.4543 0.9442</td>
<td>P 75.7105 0.7291</td>
</tr>
<tr>
<td></td>
<td>Z 2.4858 0.9935</td>
<td>Z 0.6313 0.7361</td>
</tr>
<tr>
<td></td>
<td>L 2.5791 0.9947</td>
<td>L 0.5406 0.7053</td>
</tr>
<tr>
<td></td>
<td>Pm 1.508 0.9342</td>
<td>Pm -0.6395 0.7388</td>
</tr>
<tr>
<td>GDS</td>
<td>P 109.7064 0.0314</td>
<td>P 77.6548 0.6739</td>
</tr>
<tr>
<td></td>
<td>Z -1.6742 0.047</td>
<td>Z 0.6331 0.7367</td>
</tr>
<tr>
<td></td>
<td>L -1.6906 0.0462</td>
<td>L 0.5592 0.7117</td>
</tr>
<tr>
<td></td>
<td>Pm 1.9833 0.0237</td>
<td>Pm -0.4895 0.6878</td>
</tr>
<tr>
<td>ALR</td>
<td>P 8.7312 1.000</td>
<td>P 379.7289 0.000</td>
</tr>
<tr>
<td></td>
<td>Z 8.6095 1.000</td>
<td>Z -13.5453 0.000</td>
</tr>
<tr>
<td></td>
<td>L 8.6169 1.000</td>
<td>L -15.8227 0.000</td>
</tr>
<tr>
<td></td>
<td>Pm 5.8071 1.000</td>
<td>Pm 22.816 0.000</td>
</tr>
<tr>
<td>PGR</td>
<td>P 506.8647 0.000</td>
<td>P 242.1154 0.000</td>
</tr>
<tr>
<td></td>
<td>Z -10.97 0.000</td>
<td>Z -5.6039 0.000</td>
</tr>
<tr>
<td></td>
<td>L -18.912 0.000</td>
<td>L -8.0738 0.000</td>
</tr>
<tr>
<td></td>
<td>Pm 32.6247 0.000</td>
<td>Pm 12.1989 0.000</td>
</tr>
</tbody>
</table>

Notes: Null hypothesis: presence of unit root. Automatic Selection of maximum lags, based on AIC: 0 to 3 lags.
Table 3-6 ECM Panel Cointegration Tests (Westerlund)

<table>
<thead>
<tr>
<th>Tests</th>
<th>Value</th>
<th>Z</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>AID</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gt</td>
<td>-3.514</td>
<td>-9.348</td>
</tr>
<tr>
<td></td>
<td>Ga</td>
<td>-22.662</td>
<td>-10.487</td>
</tr>
<tr>
<td></td>
<td>Pt</td>
<td>-27.23</td>
<td>-15.769</td>
</tr>
<tr>
<td></td>
<td>Pa</td>
<td>-23.841</td>
<td>-16.152</td>
</tr>
<tr>
<td></td>
<td>Gt</td>
<td>-3.714</td>
<td>-10.958</td>
</tr>
<tr>
<td></td>
<td>Ga</td>
<td>-23.627</td>
<td>-11.427</td>
</tr>
<tr>
<td></td>
<td>Pt</td>
<td>-26.471</td>
<td>-14.883</td>
</tr>
<tr>
<td></td>
<td>Pa</td>
<td>-25.45</td>
<td>-17.898</td>
</tr>
<tr>
<td>FDI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gt</td>
<td>-3.806</td>
<td>-11.704</td>
</tr>
<tr>
<td></td>
<td>Ga</td>
<td>-22.872</td>
<td>-10.692</td>
</tr>
<tr>
<td></td>
<td>Pt</td>
<td>-26.702</td>
<td>-15.153</td>
</tr>
<tr>
<td></td>
<td>Pa</td>
<td>-24.046</td>
<td>-16.374</td>
</tr>
<tr>
<td>REM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gt</td>
<td>-3.674</td>
<td>-10.639</td>
</tr>
<tr>
<td></td>
<td>Ga</td>
<td>-26.614</td>
<td>-14.338</td>
</tr>
<tr>
<td></td>
<td>Pt</td>
<td>-26.138</td>
<td>-14.496</td>
</tr>
<tr>
<td></td>
<td>Pa</td>
<td>-25.261</td>
<td>-17.693</td>
</tr>
<tr>
<td>GDS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gt</td>
<td>-3.786</td>
<td>-11.537</td>
</tr>
<tr>
<td></td>
<td>Ga</td>
<td>-17.213</td>
<td>-5.179</td>
</tr>
<tr>
<td></td>
<td>Pt</td>
<td>-23.849</td>
<td>-11.83</td>
</tr>
<tr>
<td></td>
<td>Pa</td>
<td>-19.287</td>
<td>-11.212</td>
</tr>
<tr>
<td>ALR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gt</td>
<td>-4.443</td>
<td>-16.841</td>
</tr>
<tr>
<td></td>
<td>Ga</td>
<td>-19.734</td>
<td>-7.634</td>
</tr>
<tr>
<td></td>
<td>Pt</td>
<td>-28.53</td>
<td>-17.282</td>
</tr>
<tr>
<td></td>
<td>Pa</td>
<td>-22.162</td>
<td>-14.33</td>
</tr>
<tr>
<td>PGR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gt</td>
<td>-4.443</td>
<td>-16.841</td>
</tr>
<tr>
<td></td>
<td>Ga</td>
<td>-19.734</td>
<td>-7.634</td>
</tr>
<tr>
<td></td>
<td>Pt</td>
<td>-28.53</td>
<td>-17.282</td>
</tr>
<tr>
<td></td>
<td>Pa</td>
<td>-22.162</td>
<td>-14.33</td>
</tr>
</tbody>
</table>

Notes: Akaike information criterion (AIC) can be used in the error correction equations to determine an optimal lag length for each separate time.
## APPENDIX V

### Variables Description

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>∆lnGDP per capita.</td>
<td>GDP per capita is gross domestic product divided by midyear population. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products.</td>
<td>World Bank, WDI.</td>
</tr>
<tr>
<td>lnGDP_{t-1}</td>
<td>The log of Lagged GDP per capita.</td>
<td>World Bank, WDI.</td>
</tr>
<tr>
<td>AID</td>
<td>The ratio of net official development assistance and official aid received to GDP. Net official development assistance consists of disbursements of loans made on concessional terms (net of repayments of principal) and grants by official agencies of the members of the Development Assistance Committee (DAC), by multilateral institutions, and by non-DAC countries.</td>
<td>Calculated from data of World Bank, WDI</td>
</tr>
<tr>
<td>FDI</td>
<td>The ratio of FDI net inflow to GDP. Foreign direct investment are the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. This series shows net inflows in the reporting economy.</td>
<td>World Bank, WDI</td>
</tr>
<tr>
<td>REM</td>
<td>The ratio of remittance receipts to GDP. Workers' remittances are current transfers by migrants who are employed or intend to remain employed for more than a year in another economy in which they are considered residents. Some developing countries classify workers' remittances as a factor income receipt (and thus as a component of GNI). The World Bank adheres to international guidelines in defining GNI, and its classification of workers' remittances may therefore differ from national practices. This item shows receipts by the reporting country.</td>
<td>World Bank, WDI</td>
</tr>
</tbody>
</table>
GDS  The ratio of gross domestic saving to GDP. Gross domestic savings are calculated as GDP less final consumption expenditure (total consumption). Source: World Bank national accounts data, and OECD National Accounts data files.

ALR  The adult literacy rate (% of people ages 15 and above). Adult literacy rate is the percentage of people ages 15 and above who can, with understanding, read and write a statement on their everyday life.

SCHOOL  School enrollment, primary (% gross). Gross enrollment ratio is the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown. Primary education provides children with basic reading, writing, and mathematics skills along with an elementary understanding of such subjects as history, geography, natural science, social science, art, and music.

PGR  The population growth rate. Annual population growth rate for year t is the exponential rate of growth of midyear population from year t-1 to t, expressed as a percentage. Population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship--except for refugees not permanently settled in the country of asylum, who are generally considered part of the population of the country of origin.

TRADE  The ratio of trade to GDP. Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.

M2  Average annual growth rate in money and quasi money. Money and quasi money comprise the sum of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of resident sectors other than the central government. The change in the money supply is measured as the difference in end-of-year totals relative to the level of M2 in the preceding year.
INF  Inflation, consumer prices (annual %). Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a fixed basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used.

CPI  Corruption Perception Index. Transparency International (TI) rank countries annually by their perceived levels of corruption, as determined by expert assessments and opinion surveys on a scale from 10 (very clean) to 0 (highly corrupt).
APPENDIX VI

Group of Countries

All developing economies are those in which (2006) GNI per capita was $11,115 or less. Middle-income economies are those in which GNI per capita was between $906 and $11,115 and low-income economies are those in which GNI per capita was $905 or less.

(1) Low and Middle Income Countries included in the PMG panel regression:

Argentina, Bangladesh, Benin, Bolivia, Botswana, Brazil, Burkina Faso, Cameroon, China, Colombia, Costa Rica, Côte d'Ivoire, Dominican Republic, Egypt, Arab Rep., El Salvador, Ghana, Guatemala, Honduras, India, Indonesia, Jordan, Kenya, Lesotho, Mali, Mexico, Morocco, Mozambique, Pakistan, Panama, Papua New Guinea, Paraguay, Philippines, Rwanda, Senegal, Sierra Leone, Sri Lanka, Sudan, Swaziland, Syrian Arab Republic, Thailand, Tunisia, Turkey.

(2) Low and Middle Income Countries included in the GMM panel regression:

APPENDIX VII

Unit root test and panel cointegration test

(i) Fisher-type Tests: These tests perform unit-root tests for each panel individually, and then combine the p-values to produce an overall test. It pools p-values using the inverse chi-squared, inverse normal, and inverse logit transformations. It does not require strongly balanced data, and the individual series can have gaps. These tests allow for heterogenous dynamics on the lags in the ADF regressions, and allow for an optimal choice of lag length to ensure white noise errors. These tests assume that T tends to infinity. If the number of panels, N, is fixed, then these tests are consistent against the alternative that at least one panel is stationary. In contrast, if N tends to infinity, then the number of panels that do not contain a unit root must grow at the same rate as N for the tests to be consistent.

(ii) Panel Cointegration Tests: The underlying idea of the four panel cointegration tests developed by Persyn, D. and J. Westerlund (2008) is to test for the absence of cointegration by determining whether there exists error correction for individual panel members or for the panel as a whole. It considers the following error correction model, where all variables in levels are assumed to be I(1)

\[
\begin{align*}
    dY_{it} &= C_i + a_{i1} dY_{it-1} + a_{i2} dY_{it-2} + a_{ip} dY_{it-p} + b_{i0} dx_{it} + \\
    &+ b_{i1} dx_{i,t-1} + \ldots + b_{ip} dx_{i,t-p} + a_{i} (y_{it-1} - b_{i} x_{i,t-1}) + u_{it}
\end{align*}
\]

(3.25)
a_i gives an estimate of the speed of error-correction towards the long run equilibrium \(y_{it} = -\left(\frac{b}{a}\right)x_{i,t-1}\) for that series i. The Ga and Gt test statistics test the null \(H_0: a_i = 0\) for all i versus \(H_1: a_i < 0\) for at least one i. Rejection of null hypothesis can be taken as sign of cointegration of at least one of the cross-sectional units. The Pa and Pt test statistics pool information over all the cross-sectional units to test the null against alternative. Rejection of null hypothesis can therefore be taken as sign of cointegration for the panel as a whole. The tests consider almost complete heterogeneous specification of both the long- and short-run parts of the error correction model. The series can be of unequal length. In case of correlated cross-sectional units, robust critical values can be obtained through bootstrapping. However, this method is significantly helpful when the theoretical distribution of the test statistic is unknown (Persyn & Westerlund, 2008).
APPENDIX VIII

DFE, MG, and PMG Estimators

Estimation in all three cases (DFE, MG, and PMG) is based on an error-correction Auto-Regressive Distributive Lag model ARDL with p lags of the dependent variable and common q lags of each of the right-hand side independent variables (Blackburne and Frank 2007)

\[ dy_{it} = \Phi[y_{it-1} + \theta x_{it}] + d.y_{it-1} a_1 + \cdots + y_{it-p} a_p + d x_{it} b_1 + \cdots + d x_{it-q} b_q + \varepsilon_{it} \quad (3.26) \]

where \( y_{it} \) is the dependent variable; \( x_{it} \) is a \((k \times 1)\) vector of explanatory variables; \( i = 1, 2, \ldots, N \) and \( t = 1, 2, \ldots, T \) are the cross-section and time series dimensions, respectively. \( \Phi \) is the error correction speed of adjustment parameter to be estimated, \( \beta \) is a \((k \times 1)\) vector of parameters, \( a_1, \ldots, a_p \) are \( p \) parameters to be estimated, \( x_{it} \) is a \((1 \times k)\) vector of covariates, \( b_1, \ldots, b_q \) are \( q \) parameters to be estimated and \( e_{it} \) is the error term.

The MG estimator runs equation (3.26) for each group independently and then considers the un-weighted averages of all (short and long-run) coefficients across cross-sections as the consistent mean-group estimates. In the PMG estimation, the long-run coefficients and speed of adjustment are obtained by maximizing a concentrated log-likelihood function of the panel data model, i.e., the product of likelihoods of each group. Beginning with an initial estimate of the long-run homogenous parameters (such as static fixed effects), estimates of error-correction coefficients and the other short-run coefficients (including country-specific intercepts and error variances) is calculated as the averages of the estimated error-correction coefficients and short-run parameters for each cross-section. These average estimates are used to get the long-run parameters. There is repetition of the same process until convergence is achieved. Therefore, the long-run parameters are non-linear functions of the short-run parameters.
Conclusion

There exists much controversy as to whether international migration in general, and migrants’ remittances in particular, increase or decrease economic welfare at origin. The aim of this research is to contribute to the international discussion on remittances by presenting novel insights on the basis of theoretical and empirical analysis.

The first chapter presents an analysis of the effects of overseas remittances on the evolution of income inequality and wealth distribution. The analysis is based on an overlapping generations model in which inequalities are explained by a combination of capital market imperfections and fixed costs of investment. Together, these features give rise to credit rationing such that some members of the population are denied opportunities that would otherwise make them better off. Within this framework, we study the implications of remittances associated with child migration. We consider two alternative scenarios which differ according to who receive remittances – parents or siblings. Our results show that in the case of large flows of remittances, both types of intra-family transfer reduce inequality through facilitating entrepreneurship, but that the latter is more potent in doing so. We extended the model further to allow for endogenous migration. We found that compared to subsistence agent, the entrepreneurs are less constrained for sending children abroad. We also found that in the absence of large flow of remittances there are in fact some remittance-receiving households who are engaged in low yielding subsistence activity. But since remittances enhance intergenerational accumulation of wealth, these remittance-receiving households will soon be able to overcome the wealth constraint to set up entrepreneurial activities. The households who do not have access to migration, once intergenerational wealth accumulation allows them to overcome the wealth constraint for migration, the flow of remittances would enhance their savings such that they get access to the capital market to setup businesses. Thus, the economy will converge to the unique long run income distribution.
In the second chapter, we empirically investigated to what extent the receipt of remittances affects household investment in entrepreneurial activity. We found that the impact of remittances on business investment varies across countries. Based on macroeconomic observations, we argued that remittances promote entrepreneurship only in those countries which are enjoying large and stable flows of remittances over the years. Before sanctioning credit to the recipient of remittances, who actually built up necessary collateral using earnings from remittances, the financial intermediaries would consider the overall macroeconomic trend of remittances in order to minimise the risk of lending.

In the third chapter we investigated whether less dependence on foreign aid and more dependence on enhanced remittance earnings could accelerate capital accumulation and growth of the recipient countries. In the PMG estimation, we found empirical evidence of quite the opposite effect of these two forms of external capital; foreign aid has a detrimental effect whereas international remittances have a favourable effect on growth. However, GMM estimation, which allowed us to control for other variables affecting growth, we found robust evidence that in Low and Middle Income Countries remittances enhance growth; aid has insignificant effect on growth; but aid interacted with corruption deteriorates growth. At the end of this chapter, our theoretical model shows that remittances are more effective than foreign aid in enhancing capital accumulation. We found that even in the presence of corruption the potential of international remittances in augmenting capital accumulation can be fully realised. This is not true for aid which suffers from corruption.

In this study we found that stable and increasing flow of remittances not only enhances growth of the recipient economy but also results in more equitable income distribution. In this context, developing countries might consider appropriate macroeconomic policies to enhance the flow of remittances, to promote the saving propensity of remittance receivers, and to help invest these savings in more profitable ways. Emphasis should be given on (i) promoting potential migrants to acquire appropriate skills in demand, (ii) lowering transaction cost to encourage formal transfers (iii) making saving instruments attractive for remittance receivers (iv) looking after the migrants’ welfare at home and
abroad and (v) creating a conducive environment for investment opportunities by improving institutional and physical infrastructure.

A large increase in remittances would translate into a correspondingly large increase in money supply. The monetary authority can mop up excess liquidity from the market to tackle inflation. Large flow of remittances increases the supply of foreign exchange. Again, the monetary can mop up excess foreign currency from the market in order to retain export competitiveness. However, the monetary authority can approach the limits of its use of instruments. Hence, increasing the capacity of investment is very crucial. Lack of investment will show up as current account surplus in the balance of payments and will only build up international reserves.

Proper utilisation of remittances would potentially reduce the dependency of the Low and Middle Income Countries on some unproductive forms of foreign aid. If rich countries truly aim to help developing countries to achieve higher growth, they would need to open up labour markets. This opening will increase the world welfare which is the ultimate goal of globalization. It is now, more than ever, crucial to think critically about what would boost third world economies without making them permanently dependent on first-world aid. If we ignore these complexities, the third world will remain neglected forever. And globalization may falter to a great extent.

In this study, two components of balance of payments have been used to compile statistics on remittances - workers’ remittances and employee compensation. However, it would have been ideal if data on net employment compensation could be used while compiling the remittance series. Due to the unavailability of data at the level of detail required for most of the developing countries, it was not possible to compute the net employment compensation by subtracting the amount spent in the host country from the total earning. In this study, we used the Latin American Migration Project (LAMP) survey data on Nicaragua, Haiti, Guatemala, Dominican Republic, and Costa Rica. Though LAMP carried out fieldwork in the El Salvador and Colombia most recently, the data was not available at the time of this study. In the LAMP data, we only found qualitative information on remittances (i.e., whether remittances are a small, medium, or
substantial part of household total income) and whether they are using remittances for some specific purposes (i.e., whether they are investing in business, buying houses or vehicles). It would have been ideal if we could get quantitative information on the amount of remittances the households are receiving and also the amount of remittances they are spending for different purposes. Moreover, the LAMP survey data do not provide information on migrants’ transfer of accumulated assets while returning to their home country, and as a result we could not study the impact of this form of transfers. This is potentially an important channel through which migration could promote entrepreneurial activity.
APPENDIX IX

Matlab Codes

Chapter 1

Matlab Programming was used to construct the variables uspastexperience and uscurrenttrip. It helped us to calculate the total years of uspastexperience per household and uscurrenttrip

Description of the function SumAvg()

option = input('please give a choice, 1 for sum, 2 for mean : ') ;
    if option==1 % doing sum
        disp('doing SUM.....')
    else
        disp('doing MEAN.....')
    end
[data,file]=ReadFromExcel('please select a file for analysis : ');
disp('Doing Calculation')
TitleStr=data(1,:);
data(1,:)=[];
Data=cell2mat(data); % converting to numeric data
FinalData=[];
community=FindRepeatedData(Data(:,1));
for i=1:length(community)
    id=find(Data(:,1)==community(i));
    temp=Data(id,:);
    HouseHoldNumber=FindRepeatedData(temp(:,2));
    for j=1:length(HouseHoldNumber)
        id2=find(temp(:,2)==HouseHoldNumber(j));
        for k=1:size(Data,2)-2;
            if option==1 % doing sum
                s_sum(k)=sum(temp(id2,2+k));
            end
        end
    end
end
optionstr='sum';
end
if option==2 % doing mean
    id2(find(isnan(Data(id2,2+k))==1))==[]; % removing id where there is no data
    s_um(k)=mean(temp(id2,2+k));
    optionstr='mean';
end
    NewData(j,1)=community(i);
    NewData(j,2)=HouseHoldNumber(j);
    for k=1:size(Data,2)-62;
        NewData(j,2+k)=s_um(k);
    end
    end
    FinalData=[FinalData ; NewData];
end

Chapter 2

1. **Drop countries having less than 80% data for each variable over the years**

We have identified 42 countries having at least 80% data for each variable over the years 1981-2008. It means that there is at most 4 missing values out of 28 in each series, if there is any. We developed the following Matlab Codes to accomplish the task.

function data=RemoveCountriesHavingLessDataPoints
    a=str2num(char(inputdlg({'please give the amount of data requried for prediction in %' ;
    'data starting column'},...
    'data amount',1,{'80'; '4'})));
    DataAmount=a(1);
    DataStartingColumn=a(2);
    [data, file]=ReadFromExcel;
TitleStr=data(1,:);
data(1,:)=[];
CountryIDs=cell2mat(data(:,1));
CountryID=RemoveRepeatedNumbers(CountryIDs);
IDtoRemove=[];
IDSurvived=[];
for i=1:length(CountryID)
    id=find(CountryIDs==CountryID(i));
    temp=data(id,DataStartingColumn:end);
    X=size(temp,1);
    for j=1:size(temp,2)
        Y(j)=length(find(~isnan(cell2mat(temp(:,j)))==1));
    end
    Y=min(Y);
    if floor(Y/X*100) < DataAmount
        IDtoRemove=[IDtoRemove; id];
    else
        IDSurvived=[IDSurvived i];
    end
end
disp([num2str(round(length(IDSurvived)/i*100)) ' % DATA OR ' num2str(length(IDSurvived)) '-COUNTRY SURVIVES IF ' num2str(DataAmount) ' % DATA IS REQUIRED'])
data(IDtoRemove,:)=[];

2. Linear Filling Missing Values

Since series like adult literacy rate follows a trend, linear approximation has been used to fill the missing values. First, we identified the missing values in the variable literacy rate in each panel, and then the idea was to consider a straight line that best fit the data points of the series for each country separately, then fill the missing values using linear prediction given by the straight line.
function NewData=PredictData
% (year will be in the horizontal axis)
a=inputdlg({'data start column '; 'prediction range' ;'DegreeOfPolynomial' ;'year span','1',... '{'2';'1981 : 1994'; '1'});
DataStartColumn=str2num(a{1});
PredictionRange=str2num(a{2}); % keep it empty if you do not want it for a range
DegreeOfPolynomial=str2num(a{3});
[data, file]=ReadFromExcel();
XData=cell2mat(data(1, DataStartColumn :end));
TitleStr=data(1,:);
data(1,:)=[];
NumericData=cell2mat(data(:,DataStartColumn:end));
NewData=[];
for i=1:size(NumericData,1)
  disp(['doing row ' num2str(i)])
  YData=ApplyPrediction(XData,NumericData(i,:),DegreeOfPolynomial, PredictionRange);
  disp(YData)
  NewData=[NewData; YData];
end
TitleStr(DataStartColumn:end)=[];
TitleStr=[TitleStr NumToStrMatrix(PredictionRange)];
NewData=[TitleStr; [data(:,1:DataStartColumn-1) NewData]];
APPENDIX X

Graphical Representation

Figure 3-5 Full Sample: 143 Low and Middle Income Countries
Figure 3-6 Sample Used for Analysis: 42 Low and Middle Income Countries
Figure 3-7 Detection of Missing Values
Figure 3-8 Linear Approximation of Missing Values
BIBLIOGRAPHY


