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Christian Hubert Ebeke

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Université d'Auvergne Clermont-Ferrand I

Faculté des Sciences Économiques et de Gestion

École Doctorale des Sciences Économiques, Juridiques et de Gestion

Centre d'Études et de Recherches sur le Développement International (CERDI)

Essais sur les effets macroéconomiques des envois de fonds des migrants dans les pays en développement

Essays on the macroeconomic consequences of remittances in developing countries

Thèse Nouveau Régime

Présentée et soutenue publiquement le 24 Juin 2011

Pour l'obtention du titre de Docteur *ès* Sciences Économiques

Par

Christian Hubert Xavier Camille Ebeke

Sous la direction de

M. le Professeur Jean-Louis Combes et M. le Directeur de Recherche CNRS Patrick Plane

Membres du Jury :

Présidente	Mathilde Maurel,	Directrice de recherche CNRS, Université de Paris 1 Panthéon-Sorbonne.
Rapporteurs	Jean-Paul Azam,	Professeur, Toulouse School of Economics, Université de Toulouse 1 (France).
	Ralph Chami,	Division Chief at the Middle East and Central Asia Department, International Monetary Fund, Washington, D.C.
Directeurs	Jean-Louis Combes,	Professeur à l'Université d'Auvergne (CERDI).
	Patrick Plane,	Directeur de recherche CNRS, Université d'Auvergne (CERDI).

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La faculté n'entend donner aucune approbation ou improbation aux opinions émises dans cette thèse. Ces opinions doivent être considérées comme propres à leur auteur.

A ma regrettée mère. Voilà maman, j'y suis parvenu…Merci pour tout.

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Table of contents

General introduction 1

Part 1. Remittances and aggregate welfare 21

Chapter 1. Remittances and the prevalence of working poor in developing countries 22

Chapter 2. Remittances and household consumption instability 57

Chapter 3. Do remittances dampen the effects of natural disasters on output volatility? 94

Part 2. Remittances and the Government 121

Chapter 4. Remittances, openness and government size 122

Chapter 5. Do remittances lead to a public moral hazard? 157

Chapter 6. Remittances, value added tax and tax revenues 194

General conclusion 219

General introduction

International remittances defined as the money sent back by migrant workers living abroad constitute one of the most important aspects of the current economic globalization.[1] These flows result from the fact that more than 215 million people or 3 percent of the world population, live outside their countries of birth (United Nations Statistics Division).

Remittance inflows to developing countries have tremendously increased since two decades. On the one hand, this increasing trend could reflect the effort made by some countries to better record remittance inflows in their balance of payments. On the other hand, the trend could reflect the counterpart of the migration pressure that is observed around the world: both south-south and south-north migrations. According to the World Bank (2011), in 2010, worldwide remittance flows are estimated to have exceeded $440 billion. From that amount, developing countries received $325 billion (7% of this amount is received by the low income countries and 93% by the middle income group), which represents an increase of 6 percent from the 2009 level. The true size, including unrecorded flows through formal and informal channels, is believed to be significantly larger.[2] Recorded remittances in 2009 were nearly three times the amount of official aid and almost as large as foreign direct investment (FDI) flows to developing countries.

[1] In the empirical literature, there are two main approaches in measuring remittances. The broader measure records remittances as the sum of three aggregates: First, *workers' remittances* records current transfers to nonresidents by migrants who are employed in, and considered a resident of, the countries that host them. The category *employee compensation* is composed of wages, salaries, and other benefits earned by individuals in countries other than those in which they are residents for work performed for and paid for by residents of those countries. Finally, *migrants' transfers* are contra-entries to the flow of goods and changes in financial items that arise from individuals' change of residence from one country to another, such as movement of accumulated savings when a migrant returns permanently to the home country. In most research on remittances, all three types of transfers are summed and labeled "remittances". But as Chami, Fullenkamp and Gapen (2009) showed, this aggregation is not appropriate, since the three different types of transfers have different properties and respond differently to economic shocks. The narrower definition of remittances records only the first category but suffers from the limitation that for many countries, the distinction between the three categories is not possible.

[2] Page and Plaza (2006) have estimated that the share of unrecorded remittances in total remittances averages 48% worldwide, ranging from 73% in Sub-Saharan Africa to a negligible amount in South Asia. Sub-Saharan Africa has the highest share of unrecorded remittances, which reflects the fact that the informal channels are common in many African countries because the formal financial infrastructure is limited (Sander and Maimbo, 2003).

In economic terms, remittances represent a significant amount of external resources for many developing countries. For example, there are more than 20 countries for which the remittance-to-GDP ratio exceeds 2 digits in 2009: Tajikistan (35%), Tonga (28), Lesotho (25), Moldova (23), Nepal (23), Lebanon (22), Samoa (22), Honduras (19), Guyana (17), El Salvador (16), Jordan (16), Kyrgyz (15), Haiti (15), Jamaica (14), Bosnia and Herzegovina (13), Serbia (13), Bangladesh (12), Philippines (12), Albania (11), Togo (10), Nicaragua (10) and Guatemala (10).

The high economic importance of remittances has increased the interest of researchers in various macroeconomic aspects.

The dynamic properties of remittances: Stability and countercyclicality

While it is now recognized that remittances appear more stable than the other components of the balance of payments such as exports, foreign direct investment (FDI) or official development assistance (Chami et al., 2008; Gupta et al., 2009, Neagu and Schiff, 2009), the question whether remittance inflows increase when the output gap is negative (countercyclicality) or when the output gap is positive (procyclicality) is a hot debate. At the macroeconomic level, the issue of the cyclicality of remittances has two main implications. From a theoretical point of view, the cyclicality of remittances informs on the motive behind remittances. Countries with altruistic migrants are those receiving countercyclical remittances while procyclical remittances are the feature of countries for which remittances are driven by the investment motive. From a practical view, the nature of the cyclicality of remittances informs the policymakers on the role that remittances could play in mitigating bad shocks when they are countercyclical. In contrast, procyclical remittances could become a real concern when they threaten the macroeconomic stability by exacerbating the domestic business cycle.

The macroeconomic empirical literature analyzing the cyclical properties of remittances consists of an evaluation of the cyclicality of remittances with respect to the GDP cycle. For some authors, remittances react countercyclically to the real GDP cycle at home (see Sayan, 2006 for the case of the low and lower middle income countries). Lueth and Ruiz-Arranz (2007) however conclude that remittances are aligned with the business cycle in Sri Lanka. Acosta et al. (2008a) showed that the countercyclicality of remittances increases with the level of economic development, being highest among upper-middle income countries. This result is close to that of Giuliano and Ruiz-Arranz (2009) who concluded that remittances were more procyclical in countries with shallower financial systems. Neagu and Schiff (2009) addressed the question of the cyclicality of remittances and found that remittances are pro-cyclical in 65% of cases in the period 1980-2007 using 116 developing countries. Gupta et al. (2009) showed that remittance de-trended flows for Sub-Saharan Africa are positively correlated with GDP growth during the period 1980-1995 but remittances appear countercyclical with respect to growth during the last decade. Recently, Frankel (2011) using a bilateral panel data on remittances showed robustly that remittances are countercyclical with respect to income in the worker's country of origin (the recipient of the remittance), while procyclical with respect to income in the migrant's host country (the sender of the remittance).

Two important elements emerge from this literature. First, when bilateral panel data are mobilized and the business cycle in the migrant host country is also taken into account, the countercyclicality of remittances is perceived. Secondly, the econometric approach to measure the cyclicality of remittances vis-à-vis the output gap is suitable to gauge robustly the strength of the relationship between remittances and the business cycle. However, the empirical literature has so far neglected the issue of the endogeneity of the domestic business cycle with respect to remittance inflows even though the reverse causality is evident. Indeed,

regressing simply the remittance cycle on the domestic output gap could lead to misleading results if the issue of the reverse causality going from remittances to the domestic business cycle is not tackled.

The macroeconomic determinants of remittances

The empirical literature on the macroeconomic determinants of remittance inflows has provided clear results. The empirical method has consisted in mobilizing aggregated data at the country level and using panel data estimators to identify the effects of specific variables explaining remittance inflows.

The first variable that is recognized to explain significantly the level of remittances that a country receives is the level and the composition of the stock of migrants. Countries that export a large number of emigrants receive on average more remittances than the others (Freund and Spatafora, 2008; Lueth and Ruiz-Arranz, 2008; Frankel, 2011). The composition of the migrant stock also matters. Indeed, two recent papers have confirmed the result that low skilled migrants remit more than the others (Faini, 2007; Adams, 2009).

The second significant determinant of remittance inflows is the financial costs associated with remitting money. Freund and Spatafora (2008) showed that high transaction costs charged by Money Transfer Agencies (MTA) significantly reduce the amount of remittances received. The negative impact of the costs of sending money on the level of remittances has also been recognized by the international community and actions toward reducing these costs have been called. In the L'Aquila 2009 G8 Summit, leaders pledged to reduce the cost of remittances by half (from 10 to 5 percent) in 5 years.[3]

[3] See paragraph 134, page 49 of the L'Aquila 2009 G8 Summit: http://www.g8italia2009.it/static/G8_Allegato/G8_Declaration_08_07_09_final,0.pdf

Beck and Martinez Peria (2009) and using the recent World Bank dataset on remittance costs showed that across all corridors the average mean cost is 10.2 percent of the amount remitted.[4] However, there is a lot of heterogeneity in costs even when one considers the same sending or the same remittance-receiving country. For example, the most recent data suggest that the most costly corridors belong to the Sub-Saharan African region: Tanzania – Kenya, Tanzania – Rwanda, Tanzania – Uganda and Ghana – Nigeria with an average cost of $45 for every transaction of $200 (which represents approximately 22%). In contrast, the least costly corridors are Saudi Arabia – Pakistan, Saudi Arabia – Nepal, United Arab Emirates – Pakistan and United States – India, with an average cost of $5.5 for sending $200. The main conclusion of the study of Beck and Martinez Peria (2009) is that corridors with larger numbers of migrants and more competition among remittances service providers exhibit lower costs. This result confirms the findings of Freund and Spatafora (2008) who found that transfer costs are lower when financial systems are more developed in the receiving country.

The third determinant of remittances recognized in the recent macroeconomic empirical literature is the occurrence of natural disasters. The existing cross country studies showed that remittances increase significantly in the aftermath of natural disasters (Yang, 2008; Mohapatra et al., 2009; David, 2010). This result highlights that remittances provide a form of insurance to households against natural shocks. Moreover, Mohapatra et al. (2009) found that remittances also constitute an ex ante risk management strategy by providing households with the financial resources needed to better prepare themselves against future shocks. Remittance-receiving households have houses built of concrete rather than mud and greater access to communication equipments. They also resort more on cash reserves rather than selling livestock to cope with drought.

[4] The World Bank sponsored online database "Remittance prices worldwide" provides data on the cost of sending and receiving relatively small amounts of money from one country to another. The site covers 200 "country corridors" worldwide, from 29 remittance sending countries to 86 receiving countries. Data are available at the following address: http://remittanceprices.worldbank.org/

Beside this literature focusing on the determinants of remittance inflows to developing countries, the question of the macroeconomic consequences of remittances has also been extensively studied.[5] We provide below a brief review of these studies.

The macroeconomic consequences of remittance inflows to developing countries

The literature on the macroeconomic consequences of the remittance inflows to developing countries can be split into two broad camps: on one side, the club of optimists and on the other side, the club of sceptics.

Taking an optimistic view, remittances contribute to the development of recipient countries by relieving households' financial constraints through their positive effect on financial development (Gupta et al., 2009; Aggarwal et al., 2011), by protecting them against natural disaster shocks (Yang, 2008; Mohapatra et al., 2009; David, 2010), and by reducing macroeconomic volatility (IMF, 2005; Bugamelli and Paternò, 2011; Chami, Hakura and Montiel, 2009; Craigwell et al., 2010). It has also been shown that remittances have a positive effect on country sovereign ratings (Avendano et al., 2011) and reduce the probability of current account reversals (Bugamelli and Paternò, 2009) what contributes to build and reinforce the credibility and the attractiveness of the receiving countries in the views of the international investors. Abdih et al. (2009) showed that the inclusion of remittances in the traditional analysis of the sustainability of the debt alters the amount of fiscal adjustment required to place debt on a sustainable path and therefore the sustainability of government debt is improved. There are still good news from remittances at the macroeconomic level. These flows reduce inter-household income inequality (Chauvet and Mesplé-Somps, 2007; Koechlin and Leon, 2007), foster economic growth in less financially developed countries

[5] There are many papers on the effects of remittances using micro-level data drawn from household surveys. While this literature provides interesting results, we limit the literature review on the papers using macro-level data given that the thesis adopts a clear macroeconomic approach and uses only macroeconomic data in all the chapters.

(Giuliano and Ruiz-Arranz, 2009), enhance economic growth in financially developed economies of the Latin American region (Mundaca, 2009) and in a context of good institutions (Catrinescu et al., 2009). Overall, they have a pro-poor effect by lowering poverty indices in receiving countries (Adams, 2005; Acosta et al., 2008b; Gupta et al., 2009)

For the sceptics (including the pessimists), there are some beware news associated with remittance inflows. The most recognized fear is that remittances contribute to increase the level of real effective exchange rate and hence, deteriorate the external competitiveness of the receiving economies. Several papers using a cross country approach with panel data have shown that remittance inflows lead to exchange rate appreciations (Amuedo-Dorantes and Pozo, 2004; Acosta, Baerg and Mandelman, 2009; Acosta, Lartey and Mandelman, 2009; Barajas et al., 2010) but at the same time, well functioning domestic financial systems help offset this appreciation by redirecting remittance inflows into a productive use (Acosta, Baerg and Mandelman., 2009). Remittances could also magnify the domestic business cycle by increasing the correlation between labor and output (Chami et al., 2008). Another fringe of the literature focusing on the dark side of remittances has consisted in examining the effect of these flows on the behavior of the receiving households and hence, has provided clear macroeconomic implications. Indeed, Chami et al. (2003) and Chami et al. (2005) emphasized that remittances could lead to a moral hazard problem on the receiving household side by reducing the labor supply and increasing leisure. This implies that remittances do not have positive effects on economic growth. This neutral effect on remittances on growth has been confirmed by a recent work of Barajas et al. (2009).

The literature has also recognized that remittance inflows do not only affect the receiving household but also the quality of the governments in developing countries. Abdih et al. (2008) using a large sample of developing countries, demonstrated that remittance inflows reduce the

governance quality in recipient countries. This arises because the access to remittance income makes government corruption less costly for domestic households to bear; consequently corruption is likely to increase. Singer (2010) provided strong support to the hypothesis that remittance inflows increase the likelihood that policy makers adopt fixed exchange rates. The author explained this result by the fact that the countercyclical behavior of remittances increases their ability to mitigate the costs of forgone domestic monetary policy autonomy.

To sum, the existing macroeconomic literature on the consequences of remittances is a mix of good news (remittances increase household welfare) and beware news (the effects beyond the households are sometimes frightening). This thesis follows this recent literature and focuses exclusively on the macroeconomic consequences of remittance inflows in a large sample of developing countries. The thesis recognizes that the effects of remittances go beyond the narrow scope of receiving households and explores also the consequences on the public sector. In each step, empirical models are specified in order to test econometrically the main hypotheses formulated while many robustness checks are also performed to test the sensitivity of the main results to various changes. Because remittance inflows are plausibly endogenous to many macroeconomic variables used as outcomes in the thesis, the instrumental variable approach is always used in order to try to identify *causal* effects.

Many points not studied by the existing literature have constituted the starting points of the essays provided in this thesis.

1. Although there are some evidences at the macroeconomic level that remittance inflows reduce poverty (Adams, 2005; Gupta et al., 2009), nothing is said about the effect of these flows on the distribution of domestic wages. The central question is: do remittances help reduce the number of people being paid less than 2$ a day? Indeed, remittance inflows can contribute to reduce poverty and hence to increase household welfare by providing financial

resources needed to increase and smooth consumption, to send children to school or to favor the access to health care services or by affecting the distribution of domestic wages through the reduction of low wages. The later effect arises when remittances increase the reservation wage and/or remittances increase the level of labor-intensive projects.

2. Despite the large number of papers focusing on the macroeconomic stabilizing effect of remittances, little is said about the consequences of remittance inflows on the household consumption instability over the time. Moreover, the issue of the identification of the type of shocks which are effectively mitigated or not by remittances has not yet been studied. Are remittances more effective to insure against natural shocks than against fiscal and financial shocks? Does the macroeconomic stabilizing effect of remittances on consumption and output depend upon the level of remittances? Put differently, is there a threshold level of remittance inflows beyond which their stabilizing effect is strongly attenuated? In this literature, little is also said about the role that remittance inflows could play in the mitigation of the consequences of natural disasters on the aggregate output. We know that remittances tend to increase in the aftermath of natural disasters and even that they contribute to build the ex ante risk management strategies in many areas. However, we are not able to conclude yet that the aggregate output is more stable in remittance-dependent disaster prone areas compared to the others. This issue is particularly relevant given that the level of remittance inflows itself could have some destabilizing effects (Chami, Hakura and Montiel, 2009).

3. Although the recent macroeconomic literature gives conflicting results regarding the nature of the relationship between remittances and the domestic financial system in promoting long run economic growth – the question is whether remittances and the domestic financial system are substitutes (Giuliano and Ruiz-Arranz, 2009) or complements for the long term economic growth (Mundaca, 2009) – the same question can hold in the case of the macroeconomic

stabilization.[6] Are remittances and the domestic financial system complements or substitutes for the stabilization of the consumption and the aggregate output? Is the stabilizing effect of remittances reinforced in less financially developed countries? These questions are not yet studied in literature and need attention.

4. Recognizing that the effects of remittances also encompass their impacts on the government behavior and on the fiscal variables, several questions therefore emerge: Do remittances induce a fiscal retrenchment in more opened countries? In other terms, is the role of insurer of last resort against external shocks often played by government spending in more opened developing countries (see Rodrik, 1998) affected by remittance inflows? Indeed, one could hypothesize that the insurance role played by remittance for households affects the incentive of the government in more opened developed country to provide insurance against external shocks through the public consumption. The second point that emerges is whether remittance inflows induce a fiscal retrenchment in social sectors (public education and health subsidies), a phenomenon called the 'public moral hazard problem'. Indeed, many scholars have cautioned the fact that remittance inflows by partially resolving bottlenecks, remittances may actually encourage states in the developing world to ignore their traditional responsibilities because they assume that remittances will fill various voids (Grabel, 2009). Chami and Fullenkamp (2009) add that if conditions are bad at home, families send more members abroad and use remittance income to compensate for the lack of government services. Therefore, they lose interest in pressuring the government to deliver better services, and the quality of government declines because the government does not feel compelled to provide services as it realizes that households can fend for themselves. A formal empirical test

[6] In this growing literature on the effects of remittances conditional on the level of financial development, Acosta et al. (2009) have empirically demonstrated that remittances by themselves tend to put upward pressure on the real exchange rate. But this effect is weaker in countries with deeper and more sophisticated financial markets.

of these assertions is therefore welcomed in order to conclude on the existence or not of the remittances induced public moral hazard problem in developing countries.

5. However, there are also good news in the relationship between remittances and the government. From a fiscal point of view, remittance inflows could increase the fiscal space in the receiving economy. While Abdih et al. (2009) showed that remittances contribute to enhance the government debt sustainability, their contribution on fiscal space could also pass through the level and the stability of tax revenues. But the question is how remittances can affect government tax revenues while they are not directly taxed by governments? It is possible that remittances increase indirectly the tax revenue ratio by expanding the tax bases. Given that remittances are primarily devoted to consumption rather than to private investment, one can expect remittances to significantly increase government tax revenues in countries that rely on an indirect tax based system like the value added tax (VAT). Chami et al. (2008) using a dynamic general equilibrium model calibrated to match the characteristics of the Chilean economy showed that the use of a tax on labor income rather than a tax on consumption has the undesirable effect of making the government rely more on inflation to appropriate resources as the level of remittances increases because remittances decrease the labor supply and consequently the labor tax base. In contrast, when the government uses consumption taxation, an increase in remittances leads to an increase in tax revenues through private consumption and the government policy is relatively less distortionary. While this result is interesting and highlights the theoretical efficiency of a consumption tax based system over the labor tax in a remittance dependent economy like Chile, the generalization of this result to the whole sample of developing countries is not yet provided. Moreover, remittances could not only increase the level of government tax revenue ratio but could also increase its stability. The stabilization of government tax revenues induced by remittances is therefore more likely to occur in countries that rely on a VAT system given the stabilizing

effect that remittances could exert on the private consumption. Altogether, countries that depend on a VAT would benefit more from remittances to increase their fiscal space.

Remainder of the thesis

The thesis is divided into two broad parts. Each part consists of three chapters.

The first part focuses on the effects of remittance inflows on several indicators of aggregate welfare. Chapter 1 analyzes the impact of remittance inflows on the share of people selling low wages. Using the most recent data on the prevalence of working poor in developing countries, the chapter examines whether the level and the regularity of remittance inflows help reduce the prevalence of working poor in receiving countries. It finally investigates whether remittances are more likely to reduce the prevalence of working poor in a context of shallow domestic financial systems. Given that remittances are suspected of endogeneity due to an obvious reverse causality issue, the variable is instrumented by the income per capita in the migrant host countries. The results highlight a robust and negative impact of remittance inflows on the low wages and this effect is stronger in a context of low level of financial development, strong macroeconomic instability and highly predictable remittances.

Chapter 2 and Chapter 3 focus more deeply on the stabilizing effect of remittance inflows. In Chapter 2, the hypothesis that remittances contribute to stabilize the household consumption per capita is tested. In addition, we examine whether this stabilizing effect of remittances diminishes in a context of high level of financial development and high levels of remittance inflows. Finally, the chapter explores the types of shocks which are significantly absorbed by remittances. Using a dynamic panel data framework and after factoring in the endogeneity of remittances, the results uncover a robust stabilizing impact of remittances on private consumption. Moreover, this stabilizing effect tends to decrease with the level of remittance

inflows and financial development. Finally, it appears that remittances contribute to absorb various shocks including natural disasters, agricultural shocks, discretionary fiscal policy, banking and financial crises and exchange shocks.

Chapter 3 continues in the same direction and analyzes the stabilizing effect of remittances on the aggregate output. More specifically, the chapter examines whether remittance inflows help dampen the effect of natural disasters on the aggregate output. This question seems particularly relevant insofar as two opposite effects of remittances can be formulated. On the one hand, remittance inflows could dampen the effects of natural disasters on the output through their contribution on ex ante risk management strategies and ex post risk coping. On the other hand, the dependency on high levels of remittance inflows could threaten the macroeconomic stability when receiving households are less incited to insure themselves or to build resilience (the well-known 'Samaritan dilemma' problem) or when high remittance inflows in the aftermath of natural disasters fuel macroeconomic instability through the standard channels of exchange appreciation or domestic inflation. Using a dynamic panel data framework and after factoring in the endogeneity of remittances, several results emerge. First, natural disasters exert a significant positive effect on the volatility of the aggregate output. Second, remittance inflows dampen this effect. Third, the shock absorber role of remittances is strongly reduced as the level of remittances increases.

To sum, the first part of the thesis has highlighted the positive contribution of remittance inflows to the private sector and the aggregate welfare. However, it appeared that this effect is not linear and some countries benefit from remittance inflows much more than others. This is especially the case of financially underdeveloped economies and countries receiving 'reasonable' amounts of remittances in proportion of their GDP.

The second part of the thesis turns to the analysis of the effect of remittance inflows on the government. Three chapters constitute this part.

Chapter 4 analyzes the link between remittances and the size of government captured by the government final consumption. The chapter revisits the Rodrik's (1998) result that more open developing economies have bigger government because the public final consumption acts as an insurance provided to the private sector against the external shocks. Starting with a simple theoretical model, the chapter shows that when countercylical remittances are accounted for, the elasticity of government spending with respect to the external risk is reduced. Indeed, remittances tend to reduce the role of insurer of last resort often played by the governments in small open economies. This hypothesis is not rejected by the data. Using a large sample of developing countries and a dynamic panel data framework, the results uncover a diminishing effect of trade openness on the government consumption as the level of remittances rises. It also appears that it is when remittances are effectively countercyclical that this fiscal retrenchment operates. In addition, the econometric estimations revealed that remittances tend to become more countercyclical as the degree of trade openness increases.

Chapter 5 tests the hypothesis that remittance inflows reduce the willingness of governments of badly governed countries to spend on social sectors (education and health). To test the existence of this public moral hazard effect induced by remittances, a large sample of developing countries and various dynamic panel data estimators are used. The results suggest that the effect of remittances on the public education or health spending turns negative at high levels of bad governance. These results confirm the intuitions formulated by Grabel (2009) and Chami and Fullenkamp (2009).

Chapter 6 is the last of the thesis. After analyzing the consequences of remittances on the governments through the expenditure side (Chapter 4 and 5), this chapter explores the issue of

the impact of remittance inflows on the government tax revenues. Based on a comprehensive dataset on tax revenues and on the presence of the value added tax (VAT) in a large sample of countries, the chapter tests the hypothesis that remittances increase both the level and the stability of the government total tax revenue ratio in countries that have adopted the VAT. This arises because remittances help increase and stabilize the private consumption (see Chapter 2) and because the private consumption constitutes the tax base of the VAT. The estimated dynamic panel data models do neither reject these hypotheses nor the transmission channel of the impact through the private consumption.

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PART 1. REMITTANCES AND AGGREGATE WELFARE

Chapter 1. Remittances and the prevalence of working poor in developing countries

1.1. Introduction

According to the recent World Bank Report (World Bank "Migration and Remittances Factbook", 2011), the worldwide remittance flows are estimated to have exceeded $440 billion in 2010. From that amount, developing countries received $325 billion. The Report also highlights that recorded remittances were nearly three times the amount of official aid (ODA) and almost as large as foreign direct investment (FDI) flows to developing countries. For instance in Sub-Saharan Africa, remittances range from less than 1% of GDP to 25% in Lesotho, and they exceed by large both FDI and aid in countries like Mauritius, Nigeria, Egypt, Morocco, Senegal and Lesotho. Ratha (2009) summarized all existing empirical evidence and conclude that for a large fraction of the poorest nations, remittances exceed both ODA and FDI.

Given this increasing evidence, it is not surprising that the last decade was marked by an increasing attention paid to the role played by remittances on development goals. At the macro level, the emphasis has been stressed on poverty, investment, growth, consumption, competitiveness and macroeconomic stability (Adams and Page, 2005; Woodruff and Zenteno, 2007; Chami et al., 2003; Giuliano and Ruiz-Arranz, 2009; Catrinescu et al., 2009; Barajas et al., 2009; Bugamelli and Paternò, 2011; Chami, Hakura and Montiel., 2009; Amuedo-Dorantes and Pozo, 2004; Barajas et al., 2010). At the micro level, a lot of research has been carried out on the relationships between labor supply and the income earned abroad and sent back by migrants (Funkhouser, 2006; Cox-Edwards and Rodriguez-Oreggia, 2009).

This paper contributes to the debate over the impact of remittances on labor market outcomes in receiving countries in three ways. It is based upon a large dataset covering about 80 developing and emerging countries over a large time span (1990-2008). This dataset contains systematic information about remittances and the proportion of poor workers, which is

defined as the proportion of individuals earning less than 2$ US per day. This allows a precise econometric estimate of the impact of remittances in reducing the number of poor workers. The results support the assumption that both the level and regularity of remittances reduce poverty, mitigate the sensitivity of the share of working poor with respect to macroeconomic shocks and finally, act as a substitute for shallowness financial markets.

The paper contributes to two strands of the literature. One is related to the macroeconomic impact of remittances on growth and poverty. The impact of remittances on economic growth in receiving countries is *a priori* ambiguous. Remittances can be essentially spent on consumption and generate moral hazard, which is detrimental to growth (Chami et al., 2003). But they can also promote investment: in a world characterized by market imperfections and liquidity constraints, potential investors and micro entrepreneurs cannot raise the funds which would allow them to launch profitable activities (Giuliano and Ruiz-Arranz, 2009). In this context, remittances provide households with available funds, which alleviate credit rationing and allow those investments to take place. As a result, the demand for non qualified labor and wages increase. It follows that the share of poor workers decreases and growth is promoted. The pro-poor effects of remittances have been demonstrated at the cross-country level by Adams and Page (2005) on a large sample of developing countries and recently by Acosta et al. (2008) in the case of Latin American countries.

The second strand of the literature is linked to the impact of remittances on labor supply, which has been extensively studied at the micro-level. In an outstanding work which based on Indian micro data, Jayachandran (2006) demonstrates that the labor supply of the poorest individuals is inelastic if workers are closer to subsistence, more credit constrained and, less able to migrate.[7] As a result, the working poor wages are continually low. Any smoothing

[7] Several papers have analyzed the labor supply elasticity in developing countries. The seminal work of Lewis (1954) assumes an horizontal labor supply function at the minimum subsistence level. This form has been

mechanism which enhances the labor supply elasticity – when market conditions are not favorable – is expected to reduce poverty. For instance, migration could affect the level of wage through two channels: the effect of migration itself and an effect via remittance inflows. In the first case, migration outflows affect the labor market outcomes by reducing the number of available workers in the region of origin. This would imply a higher equilibrium wage all else equal. For the second case, remittance inflows are supposed to increase the reservation wage of workers and may also increase the demand for labor when they are invested. Altogether, it results an upward pressure on the wage what would reduce the share of working poor.

Be it driven by the demand or supply side, the effect of remittances is to reduce the number of poor workers. Our results suggest that the reasoning conducted mostly at micro levels can be generalized with macro-data. Remittances decrease in a substantial way the share of workers below 2 dollars per day, suggesting either that labor market adjustments take place allowing poor workers to supply labor in a more elastic way, or that more funds are spent on investment which in turns increases the demand for labor. Moreover, while the level of remittances helps alleviating the number of poor workers, their predictability matters. From the supply side and in a context of risk adverse households, unpredictable remittances would not reduce household labor supply and hence the prevalence of working poor.[8] From the demand side, unpredictable remittances could reduce the share of poor workers when it is admitted that unpredictable remittances are more likely to be invested rather than to be fully consumed (Amuedo-Dorantes and Pozo, 2010a). This suggests that there are two opposite

tackled in three broad directions: negative slope function (Berg, 1961; Huang, 1976), positive slope function (Bardhan, 1979) and S-shaped labor supply curve (Dessing, 2002). Recent work highlights that the labor supply curve becomes more inelastic in a context of poverty, credit-constraints and high migration costs (Jayachandran, 2006). This result suggests that for poor constrained workers, the income effect exactly compensates for the substitution effect.

[8] However, a recent paper by Cox-Edwards and Rodriguez-Oreggia (2009) found limited evidence of labor force participation effects of persistent remittances. This result challenges the previous finding of Amuedo-Dorantes and Pozo (2010b) that workers increase labor supply when remittance inflows are less predictable.

forces in the relationship between the unpredictability of remittances and the prevalence of working poor.

The structure of the chapter is as follows. Section II reviews the literature and gives preliminary evidence on the relationships between remittances and working poor at the macroeconomic level. Section III identifies the impact of remittances on the prevalence of working poor while controlling for the remittances endogeneity. Section IV tests the hypothesis that the impact of remittances on the prevalence of working poor depends on several factors: the income volatility, the remittances unpredictability and the financial development. Section V concludes.

1.2. Preliminary evidence and overview of the existing literature

Figure 1.1 presents the distribution of the regional averages of the percentage of working poor. As expected, the figure shows that the regions characterized by the highest prevalence of working poor are Sub-Saharan Africa, South Asia and East Asia and Pacific, with more than 60% of people remunerated at less than 2$US per day. The Middle East and North Africa (MENA), Europe and Central Asia, and Latin America and Caribbean regions exhibit the lowest median values.

Figure 1.2 presents preliminary evidence suggesting a negative correlation between the dependency on remittance inflows and the prevalence of working poor in developing countries.

There are two main channels through which remittances can exert an impact on low wages. One channel is related to the labor demand side, through the increase in investment, which is covered by remittances. This happens when remittances are used for financing small business projects (Woodruff and Zenteno, 2007; Chiodi et al., 2010; Adams and Cuecuecha, 2010).

They allow the development of small entrepreneurships, which requires low qualified labor force. The demand for unskilled labor increases and wages at the bottom of the distribution should increase. To our knowledge, very few papers have investigated the impact of remittances on investment at the macro level (one exception is Giuliano and Ruiz-Arranz, 2009, and is based upon a dataset of 70 developing countries). More evidence is provided at the micro level. Dustman and Kirchkamp (2002) and Massey and Parado (1998) analyzed respectively the Turkish and Mexican cases. Woodruff and Zenteno (2007) reported that remittances are behind 20% of the capital invested in micro firms throughout urban Mexico. Chiodi et al. (2010) showed that in rural Mexico, poor rural families resort to remittances as a way to mitigate constraints that prevent them from investing in productive assets. Adams and Cuecuacha (2010) found that remittance-receiving households in Guatemala spend less at the margin on consumption (food) but more at the margin on investment (education and housing).

The second channel relates to the labor supply side. In the standard neoclassical model of labor supply, workers optimize the allocation of their time to work and other activities, including leisure. Labor supply depends upon the reservation wage, which relates to how much extra earning an individual requires to be induced to give up one unit of leisure.

The reservation wage is higher when individuals exposed to shocks can save and borrow, instead of continuing to work if market conditions deteriorate. Whenever individuals have access to formal and informal credit, their labor supply becomes more elastic. Remittances constitute one such informal mechanism and their availability reduces the vulnerability of workers, who are closer to subsistence. Another mechanism is the possibility of borrowing or drawing on savings, but in developing countries credit markets are underdeveloped and characterized by imperfections. As emphasized in Jayachandran (2006), the equilibrium wage is lower in an economy without smoothing mechanisms, because more people are obliged to work at a lower rate.

One key notion is the distance of workers to the minimum level of subsistence. The closer to this minimum level are workers, the less elastic their labor supply is. Remittances help the poorest and more vulnerable categories of workers by enabling them to quit jobs, which are paid at low rates.

Micro-evidence supports this assumption. While the impact of remittances on the overall labor force participation is mixed,[9] there is strong evidence that remittances decrease the participation of children, female adults and teenagers (Funkhouser, 2006; Calero et al., 2009; Bansak and Chezum, 2009). Children and women accept jobs at low wages, and they constitute in most developing countries the most vulnerable segment of the active population. This implies that remittances decrease the share of the most vulnerable workers paid at below 2 dollars per day.

To our knowledge there are very few studies focusing directly on the impact of migration and remittances on the share of workers selling low wages. Jayachandran (2006) highlights two crucial results concerning landless. On the one hand, landless, who are the poorest, and hence the most liquidity constrained agents, tend to have an inelastic labor supply. But, on the other hand, they are also more likely to migrate in response to bad shocks what contributes to reduce the elasticity of wages to labor demand shocks. Most studies focus on the impact of remittances on the overall supply of labor, but disregard the distinction between poor workers and the others. This paper aims at filing the gap, by using macro data.

[9] This may arise from the fact that the impact is ambiguous if the revenue from the migrant replaces the revenue he would have procured without migrating. It may be due also to the difficult task of comparing strictly identical individuals and households. For addressing this identification problem, alternative econometric strategies have been proposed. Canales (2007) and Amuedo-Dorantes and Pozo (2006) using different sources find no change for Mexican workers, while Rodriguez and Tiongson (2001) and Funkhouser (1992) provide evidence of a slight change in the labor force participation using data for Manila and Managa respectively. Gubert (2002) suggests that remittances act as an insurance and allow Malian workers to reduce their work. Cox-Edwards and Rodriguez-Oreggia (2009) using score matching techniques find little evidence of permanent remittances effect on labor force participation.

The relationship between remittances, the share of working poor and, financial development is *a priori* ambiguous. Well-functioning financial markets, by lowering transaction costs, may help use remittances as a way either to better allocate time to work and leisure, or to finance projects that yield the highest returns and foster economic growth. Mundaca (2009) using a panel of Latin American and Caribbean countries showed that financial intermediation tends to increase the responsiveness of growth to remittances. Once can thus expect a complementary relationship between remittances and the financial development in the reduction of the prevalence of working poor in receiving countries. Alternatively, remittances can compensate for the lack of finance, be it for accommodating bad shocks or for starting productive activities. In this case, remittances act as a substitute for the banking system. Giuliano and Ruiz-Arranz (2009) using a broad panel of developing countries found that formal credit and remittances are substitute rather than complement; remittances substitute for the lack of finance, which implies that their impact on growth is more pronounced whenever finance is missing. Following their line of argument, we will test the hypothesis that remittances are more efficient in reducing the number of poor workers whenever alternative funds are not available.

1.3. Do remittances reduce the prevalence of working poor? Empirical investigation.

To explore the link between remittances and working poor, we use a large dataset, which covers 85 countries over the period 1990-2007. As a starting exercise, we estimate the interaction between remittances and the percentage of working poor by running simple OLS. We estimate the following model:

$$w_{i,t} = \theta_1 R_{i,t} + X'_{i,t}\beta + \alpha_i + \eta_t + \varepsilon_{i,t} \qquad (1)$$

where *w* is the percentage of working poor in the total active population in each country *i* at year *t*. *R* is the remittance-to-GDP ratio, **X** is the matrix of control variables and α_i and η_t represent the country fixed-effects and the time dummies, respectively. $\varepsilon_{i,t}$ is the idiosyncratic error term. Our basic hypothesis is that $\theta_1 < 0$, in other terms remittance inflows reduce the prevalence of working poor.

Equation (1) includes the following control variables:

Income volatility (measured as the standard deviation of the real GDP per capita growth rate over the last five years) is a proxy for shocks. Following Jayachandran (2006), we expect a positive impact of income shocks on the prevalence of working poor since macroeconomic volatility decrease the reservation wage (workers are more likely to accept low wages in time of negative shocks).

Initial GDP per capita enters the set of control variables. We expect a negative correlation between the level of development and the prevalence of working poor. For instance, it could be a proxy for the existence and the compliance toward minimum wages legislation.

Net emigration rate (measured as the difference between migration outflows and migration inflows over the total population) is an indicator of pressure on the labor market. An increase in net emigration rate increases the reservation wage, which in turns decreases the prevalence of working poor. The inclusion of this variable ensures that the effect of remittances is not confounded with the effect due to migration. Moreover, net migration changes both the distribution of worker characteristics and the returns to these characteristics. Hanson (2007) has shown that labor force participation in high migration Mexican States decreases and that average wages in those States are higher in a range between 6% and 9%.

Financial development (measured by the private credit-to-GDP ratio) reduces the prevalence of low wages via both the labor demand and the labor supply channel. The demand channel is promoted by the firms' access to credit and private investment. The supply channel is based upon a wider possibility of drawing on savings and of borrowing, which renders labor supply more elastic (Jayachandran, 2006). As for remittances, more access to credit allows poor workers to adjust in a more optimal way. If there is a lack of finance, poor workers are blocked in poverty traps, as they have no choice but to work for low wages.

Trade openness in developing countries could decrease the prevalence of working poor by increasing the labor demand in the agricultural sector and hence the agricultural wage. The same effect exists in the natural resources sector and altogether, the working poor rate is lower. The international competition induced by trade openness leads to productivity gains in the tradable sector and shifts the level of wage above its previous value.[10] Developing countries export commodities whose production requires unskilled labor, and unskilled workers' wages in sending developing countries tend to increase.

Government consumption-to-GDP ratio is a proxy for the share of public employment in which the number of working poor is much lower.

Foreign direct investment net inflows-to-GDP ratio controls for the fact that foreign direct investment inflows increase the domestic demand for labor and hence reduce the prevalence of working poor.[11]

[10] It is worth noting that a high level of trade openness means a higher exposition to external risks which could translates into a lower reservation wage. However, since we already control for macroeconomic instability, this effect is drained-off.

[11] Chen et al. (2011) showed that FDI inflows increase inter-enterprise wage inequality in China. Their results highlighted that FDI lead to a negative spillover in terms of the wage in domestic firms. This arises when competition from multinationals may reduce the market share of local firms, which drives such firms under the minimum efficiency or even crowds them out. Nunnenkamp et al. (2007) showed that even if FDI inflows enhance economic growth and reduce poverty, they also widen income disparities between urban and rural areas

Education level (measured as the percentage of people having completed the secondary cycle) enters the set of control variables. A higher education level increase the reservation wage, and decrease the prevalence of working poor.

Income inequality (approximated by the Gini coefficient of income distribution) is introduced to ensure that the estimated effect of remittances on the prevalence of working poor is net of the effect of remittances on income inequality.[12]

Inflation rate controls for the fact that low-wage earners suffer more from the loss of real wage induced by inflation. They have to increase their labor supply in order to compensate for this loss of revenue, even more for working poor, who do not have other way of smoothing consumption but to supply more work.

Rural population rate is negatively correlated with the productivity of workers in rural area. Hence a positive association between the rural population and the prevalence of working poor is expected.

The dependent variable is measured as the share of active people who receive as wage less than 2 $US and comes from the ILO-KILM dataset.[13] Remittances record the money sent by workers who live abroad for at least one year.[14] Remittance data are drawn from the World Bank Tables. Except trade openness, government consumption and per capita income (which come from the Penn World Table 6.3. dataset), all remaining control variables are drawn from the World Bank Tables. The sample covers at most 85 countries over the period 1990-2007.

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in Bolivia. This suggests that FDI inflows can exert a pro-poor effect in receiving countries but at the same time, they can induce regional disparities.

[12] Some recent macroeconomic papers have tested the impact of remittance inflows on the income inequality in the receiving countries (Koechlin and Leon, 2007; Chauvet and Mesplé-Somps, 2007; Acosta et al., 2008).

[13] See appendix for a detailed presentation of this variable.

[14] We use the narrower definition of remittances by squeezing the compensations of employees and migrant transfers. This procedure follows Chami, Fullenkamp and Gapen (2009).

Countries list and descriptive statistics are provided in appendix at the end of the paper (Tables A1 and A2).

Table 1.1 displays the results obtained by running OLS. Whatever the specification, be it with a smaller number of controls in the first columns or a larger one in the subsequent columns, all variables have the expected sign. When all controls are included, higher income volatility, larger income inequality and higher rural population rate are associated with a higher number of poor workers. Furthermore, the initial level of economic development, the degree of trade openness and the level of education (except when the income per capita is excluded from the specification) tend to reduce the prevalence of workers paid at below two dollars per day. Convergence, competition, and income distribution do influence the share of poor workers in the active population. Some coefficients, although non-significant, have the right sign: net emigration rate, private credit to GDP ratio, government consumption over GDP, FDI over GDP, inflation rate. Those variables might suffer from colinearity when estimated jointly with other variables.

It is worth noting that whatever the specification, remittance inflows reduce the prevalence of working poor and this effect is highly significant. The estimated coefficient ranges from -0.885 (first column) to -0.507 (column 10).

The main drawback behind these preliminary results is the simultaneity bias resulting from the two ways causality running from the prevalence of working poor to remittances and *vice et versa*. If remittances reduce the number of poor workers, it is likely that poverty does induce both migration and remittances to compensate for low wages at home. OLS results might be therefore biased toward zero and they can underestimate the 'true' impact.

To deal with the endogeneity bias, we use an instrumental variable approach. The instrument is the potential earning in the migrants' host countries, which is proxied by real GDP per

capita weighted by the share of each destination country for each sending country.[15] This procedure follows recent macroeconomic works on remittances which have used the per capita income in migrant host countries as the exclusion restriction (Acosta et al., 2008; Acosta et al., 2009; Aggarwal et al., 2011). There is now an accepted result showing that remittances are positively associated with the economic conditions abroad in the host countries (Freund and Spatafora, 2008; Aggarwal et al., 2011). Meanwhile, there is no reason to suspect for a direct link between the economic conditions abroad and the prevalence of working poor when trade openness and FDI are already controlled for.

Table 1.2 presents the results of the first-stage equations of remittances. In column 1, the real GDP per capita in host countries is used as the instrument. Its coefficient (6.34) turns out to be highly significant and positive (the *F*-test of the instrumentation equation for remittances is higher compared to the Stock et al., 2002 rule of thumb of 10), which means that the sum of GDP per capita weighted by the shares of destination countries in each origin country is a good proxy for remittances. In columns 2 and 4, the results of the second stage equation suggest that the effect of remittances on the prevalence of working poor is negative and highly significant. The coefficients stand at – 1.2 and – 1.5, respectively. These values are higher (in absolute term) than previous OLS coefficients (Table 1.1) given the positive OLS bias.

Using estimates in Table 1.2, we can compute the change in the prevalence of working poor induced by a one standard deviation increase in the remittance-to-GDP ratio (set equal to 4.6%). The decrease in poor workers yields 6 percentage points (column 2), for an average prevalence of working poor standing at 48%. This impact is quite substantial.

[15] The bilateral migration matrix comes from the World Bank web site: http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTDECPROSPECTS/0,,contentMDK:21154867~pagePK:64165401~piPK:64165026~theSitePK:476883,00.html

Our results provide strong preliminary evidence that the level of remittances leads to a substantial decrease in poverty (see Jadotte, 2009; Justino and Shemyakina, 2010). We turn now to the influence of income volatility, be it wage or remittances unpredictability.

1.4. Testing for heterogeneity in the working poor-remittance nexus.

As shown in the previous section, remittances reduce the prevalence of working poor. The model is based upon the evidence that poor workers cannot adjust their labor supply, because they are close to the subsistence level. When labor market conditions deteriorate, they cannot substitute more leisure to labor. Having no access to credit – evidence about the lack of formal credit in developing countries is widely acknowledged – they cannot borrow the funds which would enable them to survive. Remittances act as insurance and allow workers to adjust their labor supply. Remittances are often seen as source of stable and regular income. What also happens if remittances are unpredictable? Indeed, household's decision-making (labor supply or investment motive) may be impacted by the unpredictability of income including remittances.

We make three conjectures. We assume first that remittances should be more efficient in fighting against selling low wages whenever income volatility is higher; second remittances should be more efficient if they are provided in a predictable way; lastly, remittances as a mechanism to cope with external shocks should be less efficient when formal credit is available.

1.4.1. Remittances and income volatility

If remittances act as an insurance for accommodating shocks, they should be more efficient when income volatility is higher. Put differently, remittances can reduce the sensitivity of low

wages with respect to the income volatility. This assumption is tested with the following model:

$$w_{i,t} = \theta_2 V_{i,t} + \theta_3 V_{i,t} * R_{i,t} + \theta_4 R_{i,t} + X'_{i,t}\beta + \alpha_i + \eta_t + \varepsilon_{i,t} \qquad (2)$$

where *V* stands for income-volatility in each country *i* at year *t* and is measured by the rolling standard deviation of the real GDP per capita growth rate over the last five years.

If the marginal impact of income volatility on the prevalence of working poor decreases with the level of remittances one would get, $\theta_2 > 0$ and $\theta_3 < 0$. Moreover, above a given threshold denoted *R**, remittances are fully stabilizing:

$$\frac{\partial w_{i,\tau}}{\partial V_{i,\tau}} = \theta_2 + \theta_3 R_{i,\tau} = 0 \Rightarrow R^* = -\frac{\theta_2}{\theta_3}.$$

Table 1.3 presents the results derived from the instrumental variable strategy.[16] The diagnostic tests in the first-stage regressions do not reject the validity of the IV approach. As expected, the interactive term is negative and significant whereas the additive term of GDP per capita growth volatility is positive but weakly significant. The threshold level for the remittance ratio stands at 7% which implies that for 21% countries in the sample, macroeconomic volatility does not increase any more the prevalence of working poor. Remittance inflows are large enough to fully absorb the shocks.

1.4.2. Volatility of remittances

The impact of both the level of remittances and the unpredictability surrounding those flows has already been studied at the micro level by Amuedo-Dorantes and Pozo (2010b) and Cox-

[16] We use the same instrument as in Table 1.2 and the interactive term of remittances crossed with the macroeconomic volatility is instrumented by the interactive term of the excluded instrument for remittances crossed with the GDP per capita growth volatility.

Edwards and Rodriguez-Oreggia (2009). The authors investigate how different remittances patterns influence the labor supply of recipient household. Our study aims at testing the effect of the unpredictability of remittance inflows on the share of working poor and therefore seeks to generalize the previous microeconometric findings established for some Latin American countries. In this paper, the proxy of the remittances unpredictability is their volatility.[17]

The following model is estimated:

$$w_{i,t} = \theta_5 RV_{i,t} + \theta_6 R_{i,t} + X'_{i,t}\beta + \alpha_i + \eta_t + \varepsilon_{i,t} \qquad (3)$$

where *RV* stands for the volatility of remittances in each country *i* at year *t*.[18] While θ_6 is expected to be negative, the sign of θ_5 is *a priori* unknown. From one hand, according to the permanent income hypothesis, unpredictable remittances should be invested more than predictable remittances, the latter being mostly used for consumption. Through the induced additional demand for labor, the impact on workers paid at below 2$ US should be to reduce their number, and θ_5 should be negative. From the other hand, if remittances are not a way to smooth consumption of workers when they are unpredictable, θ_5 could be positive (households do not reduce their labor supply). The sign of this coefficient is therefore a matter of empirics.

Results in table 1.4 (first column) are obtained by running our instrumental variable strategy. The coefficient associated with the volatility of remittances is positive at the low level of

[17] This choice does not mean that all the volatility of remittances is unpredictable. We assume only that the degree of unpredictability tends to increase when remittances become less stable. A more accurate measure of the unpredictability involves constructing a model of expectations (or time series models designed for high frequency data such as GARCH models) that goes beyond the objectives of the paper.

[18] The volatility of remittances is computed as the five-year rolling window standard error of the residual component of the log of remittances explained by its one-year lagged value and a quadratic time trend. The remittance model is estimated for each country separately.

significance of 10%. They suggest that the second effect through the labor supply is more important than the effect through private investment.

In a slightly modified version of equation (3), we consider that the volatility of remittances enters the equation in a multiplicative way:

$$w_{i,t} = \theta_7 R_{i,t} + \theta_8 R_{i,t} * RV_{i,t} + X'_{i,t}\beta + \alpha_i + \eta_t + \varepsilon_{i,t} \qquad (4)$$

We test now the hypothesis that $\theta_7 < 0$ and $\theta_8 > 0$. In that setting, θ_7 measures the effect of the level of remittances when the volatility of remittances is set at 0 whereas $\theta_7 + \theta_8 RV_{i,t}$ identifies the marginal effect of remittances for a given level of remittance volatility.[19]

Column 2 in table 1.4 presents the results obtained through our instrumental variable strategy.[20] We find that $\theta_7 < 0$ and $\theta_8 > 0$.

Combining the results of both columns indicate that the volatility of remittances contributes not only to increase the prevalence of working poor, but do increase also the marginal impact of the level of remittance inflows on the prevalence of poor workers. In other words, remittance inflows alleviate the prevalence of poverty but to a lesser extent under a higher unpredictability surrounding those inflows.

1.4.3. Remittances versus finance

We now investigate whether the effectiveness of remittances in reducing the prevalence of poor workers increases with the shallowness nature of the domestic financial system. We

[19] In the model (4), the remittance volatility is not introduced additively among the set of control variables because its coefficient would identify the effect of remittance volatility without remittances. What seems difficult to assess.
[20] Remittances volatility is considered as strictly exogenous.

adopt a threshold model, which determines endogenously the private credit-to-GDP ratio above which the relationship between poverty and remittances inflows vanishes.

The test for non-linearity is implemented with rolling estimations for different values taken by the ratio of private credit. A dummy variable d_{FD} interacted with the remittance variable is specified. d_{FD} is equal to 1 if the country has a value of the private credit ratio greater than FD^* and 0 otherwise.[21] The underlying methodology in the case of endogenous regressors has been implemented by Masten et al. (2008) and Chami and Hakura al. (2009).

We therefore estimate the following equation:

$$w_{i,t} = \theta_9 R_{i,t} + \theta_{10} R_{i,t} * d_{FD} + \theta_{11} FD_{i,t} + X'_{i,t}\beta + \alpha_i + \eta_t + \varepsilon_{i,t} \qquad (5)$$

$$\text{with } d_{FD} = \mathbf{1}\left[FD_{i,t} \geq FD^*\right]$$

where *FD* is the private credit-to-GDP ratio in each country *i* at year *t*. The hypothesis tested is that $\theta_9 < 0$ and $\theta_{10} > 0$, in other terms the absolute value of the marginal impact of remittances on the share of poor workers decreases with the level of financial development.

The top 5% and bottom 5% of the observations of the private credit ratio are dropped to ensure a feasible identification of the threshold. Private credit-to-GDP thresholds by increments of 0.5 percent are explored. Each equation corresponding to a different threshold is estimated by the instrumental variable method. The optimal threshold is the one which maximizes the F-tests of the remittance and remittances*d_{FD} instrumentation equations for all

[21] We also performed simple estimations by including an interactive term of remittances crossed with the private credit ratio. Unfortunately, the coefficient associated with the interactive term was never statistically significant different from zero.

the models in which θ_9 and θ_{10} are individually significant.[22] Testing nonlinear effect refers simply to the test of the null hypothesis that the coefficient on the interactive variable θ_{10} is equal to zero.

The optimal cutoff which maximizes the *F*-tests statistics is set at a private credit over GDP ratio equal to 20%. This is very close to the thresholds values in Giuliano and Ruiz-Arranz (2009) in their study using the level of economic growth as the dependent variable. More than 60% of the countries are concerned here by this threshold, and the median value of the private credit-to-GDP ratio in the sample stands at 19%.

Table 1.5 displays the results, which are based upon the two regimes. The first regime includes countries in which the level of financial development is under 20%. For countries belonging to this regime the marginal impact of remittances is the highest (in absolute value). The second regime consists in more financially developed countries (the ratio of private credit over GDP is over 20%). In the latter the impact of remittances, although still negative,[23] is significantly lower in absolute value. This finding supports and extends the thesis, according to which there is a substitution effect between remittances and financial development in developing countries (see Giuliano and Ruiz-Arranz, 2009).

1.5. Conclusion

Our findings are based upon a large data set which covers a wide range of developing countries over an extended period of time, namely 85 countries over 1990-2007. We generalize the existing literature which is mainly based on micro studies, and we demonstrate

[22] According to the criterion of the significance of the second stage coefficients (θ_9 and θ_{10}), only two thresholds emerged (private credit ratio of 20% and 48%). The threshold of 20% of GDP beats the second one for all the values of the *F*-test couple.

[23] Indeed, the sum of the two coefficients associated with the remittance variable remains negative (- 3.04 + 1.44 = - 1.6) and statistically different from 0 (the corresponding *P*-value of the restriction stands at 0.07).

that remittances are key for reducing the number of working poor. For an average prevalence of working poor set equal to 48%, a one standard deviation increase in the remittance-to-GDP ratio decreases the number of poor workers by a substantial 6 percentage points.

The efficiency of remittances depends upon the level of income volatility characterizing the economy. For a remittance ratio equal to 7% of GDP any increase in the macro-volatility is fully compensated, which means that income volatility does not impact any more the vulnerability of the poorest in the labor market. The degree of remittance predictability also matters. Remittance inflows alleviate the prevalence of poor workers but to a lesser extent under a higher unpredictability surrounding those inflows. Finally, we found that remittances and the domestic financial system are substitutes. For less financially developed countries the marginal impact of remittances in reducing the prevalence of working poor is the highest in absolute value. In contrast, in more financially developed countries, where the ratio of private credit over GDP is above 20% of GDP, this marginal impact is still negative, but significantly lower in absolute value.

Remittances appear as a strategy for fighting against poverty (see for instance the G8 summit declaration of 2009 at Aquila). Their pro poor effects through the reduction of low wages could be enhanced by acting on two fronts: the level of remittances and their productive uses. In the first case, it would be useful to reduce the transaction costs associated with remitting (especially in less financially developed countries where the marginal impact of remittances on low wages was found in this paper to be stronger and where the transfer costs are higher). In the second case, it is crucial to promote the reinvestment of remittances. Indeed, the reinvestment of remittances helps prevent from a sub-optimal equilibrium characterized by higher wages and weaker labor participation. The reinvestment of remittances could lead to a better equilibrium with higher wage, more labor and capital, triggered by the diffusion effects of remittances in the economy.

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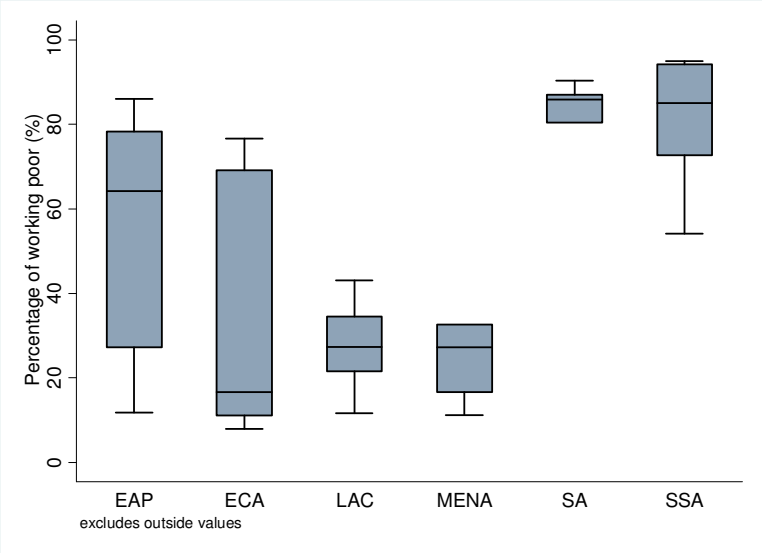

Figure 1.1. Distribution of the prevalence of working poor in the developing regions (1990-2007)
Note: In box plots, the lower and upper hinges of each box show the 25th and 75th percentiles of the samples, the line in the box indicates the respective medians, and the end-points of whiskers mark next adjacent values. EAP: East Asia and Pacific, ECA: Europe and Central Asia, LAC: Latin America and Caribbean, MENA: Middle East and North Africa, SA: South Asia, SSA: Sub-Saharan Africa.
Source: ILO KILM 6th edition dataset.

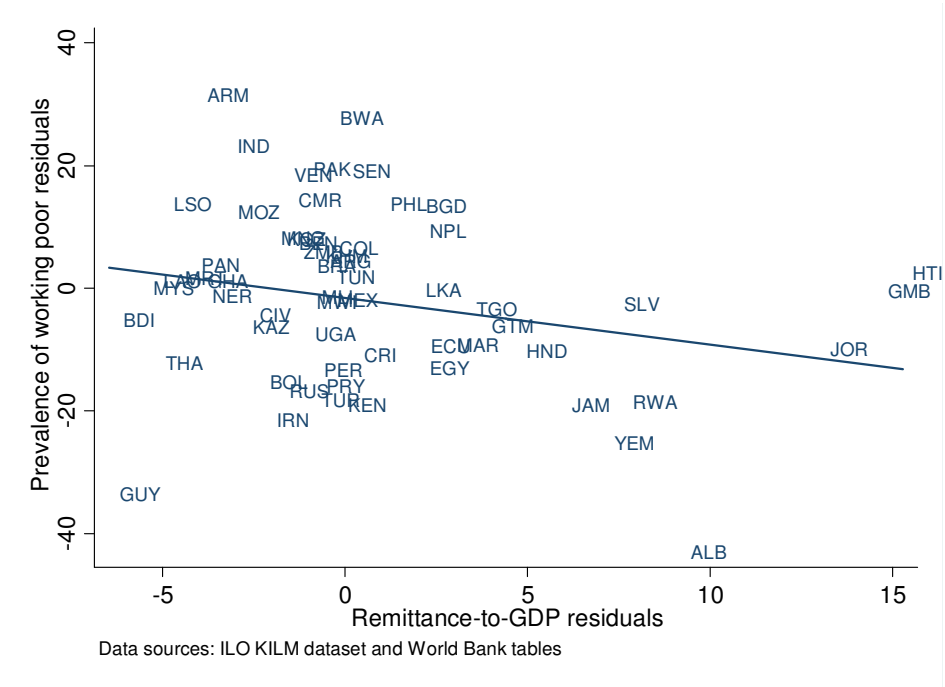

Figure 1.2. Correlation between the prevalence of working poor and remittance inflows (1990-2007).

Note: Data are averaged over the period 1990-2007.Working poor rate and remittance-to-GDP ratio are residuals derived from pooled regressions using annual data of these variables regressed on the same set of control variables (as in Tables 1.1 – 1.5). This gives adjusted measures of the prevalence of working poor rate and remittance-to-GDP ratio that are purged from any colinearity with the determinants of the prevalence of working poor.

Table 1.1: Remittances and Percentage of Working Poor, OLS-FE results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Remittance-to-GDP ratio	**-0.885*** **	**-0.816*** **	**-0.731*** **	**-0.720*** **	**-0.662*** **	**-0.607*** **	**-0.587*** **	**-0.613*** **	**-0.616*** **	**-0.507*** **	**-0.519*** **
	(-4.711)	**(-3.624)**	**(-3.708)**	**(-3.713)**	**(-3.702)**	**(-4.176)**	**(-4.193)**	**(-4.451)**	**(-4.407)**	**(-3.153)**	**(-3.444)**
Real GDP per capita growth volatility	0.0275		0.0332	0.0337	0.0347	0.100	0.0940	0.143**	0.144**	0.147**	0.143**
	(0.754)		(0.997)	(0.999)	(0.861)	(1.425)	(1.274)	(2.008)	(2.002)	(2.314)	(2.104)
Initial real GDP per capita		-16.23*	-17.54**	-17.65**	-5.382		-9.497*	-14.12***	-14.13***		-11.59**
		(-1.970)	(-2.117)	(-2.125)	(-0.812)		(-1.823)	(-2.918)	(-2.891)		(-2.203)
Net Emigration rate				-0.166	-0.334	-0.171	-0.264	-0.448	-0.449	-0.345	-0.454
				(-0.493)	(-1.404)	(-0.651)	(-1.036)	(-1.291)	(-1.320)	(-1.053)	(-1.447)
Private credit-to-GDP ratio					-0.0425	-0.0726	-0.0340	-0.0696	-0.0707	-0.0841	-0.0500
					(-0.537)	(-1.026)	(-0.435)	(-1.067)	(-1.081)	(-1.218)	(-0.721)
Trade openness					-0.0771*	-0.0532	-0.0431	-0.0482*	-0.0465	-0.0617***	-0.0498**
					(-1.781)	(-1.435)	(-1.230)	(-1.743)	(-1.670)	(-2.884)	(-2.190)
Government consumption-to-GDP ratio					4.970	4.657	3.856	0.499	0.309	0.776	-0.0490
					(1.029)	(0.670)	(0.548)	(0.0774)	(0.0474)	(0.125)	(-0.00780)
Foreign direct investment-to-GDP ratio					-0.0979	-0.0503	-0.0700	-0.0690	-0.0664	-0.0464	-0.0681
					(-0.513)	(-0.264)	(-0.367)	(-0.500)	(-0.469)	(-0.330)	(-0.493)
Education level						-0.343**	-0.251	-0.197	-0.170	-0.102	-0.0411
						(-2.074)	(-1.488)	(-1.457)	(-1.166)	(-0.582)	(-0.250)
Income inequality								0.798***	0.796***	0.764***	0.799***
								(4.602)	(4.583)	(4.156)	(4.541)
Inflation rate									0.909	0.310	0.473
									(0.954)	(0.356)	(0.537)
Rural population rate										0.559**	0.416*
										(2.485)	(1.768)
Intercept	49.02***	182.1***	192.7***	193.8***	84.69	44.20**	122.1**	133.6***	133.7***	-9.848	91.17
	(69.77)	(2.695)	(2.840)	(2.845)	(1.437)	(2.071)	(2.552)	(2.736)	(2.707)	(-0.444)	(1.598)
Observations	305	314	305	305	270	231	231	229	227	227	227
R-squared	0.073	0.140	0.149	0.150	0.123	0.154	0.167	0.310	0.311	0.305	0.323
Number of countries	83	85	83	83	73	61	61	61	59	59	59

Notes: Robust *T*-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 1.2: Remittances and Working Poor rate, IV-FE results

	First-stage	IV-FE	First-stage	IV-FE
	(1)	(2)	(3)	(4)
Remittance-to-GDP ratio		**-1.499****		**-1.258****
		(-2.089)		**(-2.159)**
Real GDP per capita growth volatility	0.00566	0.157**	0.00441	0.151***
	(0.272)	(2.420)	(0.221)	(2.836)
Initial real GDP per capita			-2.841	-12.27**
			(-1.272)	(-2.105)
Net Emigration rate	0.101	-0.239	0.0739	-0.381
	(0.626)	(-0.515)	(0.567)	(-1.091)
Private credit-to-GDP ratio	-0.0273	-0.0969	-0.0197	-0.0575
	(-1.231)	(-1.397)	(-0.826)	(-0.909)
Trade openness	4.80e-05	-0.0385	0.00159	-0.0318
	(0.00337)	(-0.991)	(0.108)	(-0.807)
Government consumption-to-GDP ratio	3.868**	3.706	3.708**	2.081
	(2.084)	(0.669)	(2.167)	(0.433)
Foreign direct investment-to-GDP ratio	0.0101	-0.00773	0.00303	-0.0406
	(0.200)	(-0.0492)	(0.0505)	(-0.255)
Education level	-0.0789	-0.108	-0.0680	-0.0423
	(-1.188)	(-0.540)	(-0.948)	(-0.227)
Inflation rate	0.615*	0.942	0.652	0.953
	(1.879)	(0.832)	(0.960)	(0.519)
Income inequality	0.0149	0.774***	0.0235	0.808***
	(0.344)	(5.191)	(0.438)	(5.683)
Rural population rate	-0.138	0.173	-0.158	0.120
	(-1.177)	(0.447)	(-1.464)	(0.352)
Exclusion restriction				
log Real GDP per capita in *host* countries	6.340***		6.695***	
	(4.022)		(4.542)	
Observations	216	216	216	216
R-squared	0.263	0.196	0.271	0.262
F-test of remittance instrumentation equation	16.18		20.63	
Number of countries	48	48	48	48

Notes: Robust *T* statistics in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table 1.3: Remittances, income shocks and Working poor rate

	IV-FE
GDP per capita growth volatility	**0.688*** **
	(4.243)
Remittance * GDP per capita growth volatility	**-0.0974*** **
	(-2.645)
Remittance-to-GDP ratio	-0.398
	(-0.537)
Initial GDP per capita	-6.285
	(-1.155)
Net Emigration rate	-0.501*
	(-1.657)
Private credit-to-GDP ratio	-0.0392
	(-0.500)
Trade openness	-0.0527*
	(-1.648)
Government consumption-to-GDP ratio	0.956
	(0.138)
Foreign direct investment-to-GDP ratio	0.0435
	(0.226)
Education level	-0.0177
	(-0.0942)
Inflation rate	1.962
	(1.252)
Income inequality	0.756***
	(4.537)
Rural population rate	0.419
	(1.048)
Observations	216
R-squared	0.167
F-stat of Remittance instrumentation: *P*-value	0.002
F-stat of Remittance*Growth volatility instrumentation: *P*-value	0.030
Joint significance of GDP volatility coefficients: *P*-value	0.000
Remittance threshold for full stabilization	7%
Number of countries above the threshold	10
Percentage of countries above the threshold (%)	21%
Number of countries	48

Notes: Robust *T*-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 1.4: Remittances, remittance unpredictability-and Working poor rate

	IV-FE	IV-FE
	(1)	(2)
Remittance-to-GDP ratio	**-2.128****	**-2.211****
	(-2.171)	**(-2.138)**
Remittance unpredictability	**6.636***	
	(1.762)	
Remittance * Remittance unpredictability		**2.195***
		(1.680)
GDP per capita growth volatility	0.0940	0.0830
	(1.280)	(0.884)
Initial real GDP per capita	-18.05**	-15.06
	(-2.037)	(-1.540)
Net Emigration rate	0.614	0.823
	(0.888)	(1.164)
Private credit-to-GDP ratio	-0.130	-0.0827
	(-1.295)	(-0.951)
Trade openness	0.00290	-0.00742
	(0.0416)	(-0.116)
Government consumption-to-GDP ratio	18.92*	16.13**
	(1.847)	(2.048)
Foreign direct investment-to-GDP ratio	-0.192	-0.142
	(-0.852)	(-0.628)
Education level	-0.233	-0.178
	(-0.967)	(-0.754)
Inflation rate	-0.00610	0.649
	(-0.00552)	(0.321)
Income inequality	0.844***	0.790***
	(3.862)	(3.818)
Rural population rate	-0.686	-0.362
	(-1.035)	(-0.606)
Observations	152	152
R-squared	0.119	0.110
F-stat remittance instrumentation: *P*-value	0.034	0.009
F-stat Remittance* Remittance unpredictability instrumentation: *P*-value		0.000
Joint significance of remittance coefficients: *P*-value		0.081
Number of countries	33	33

Notes: Robust *T*-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 1.5: Remittances, financial development and Working Poor rate, IV-FE results

Remittance-to-GDP ratio	**-3.035****
	(-2.514)
Remittances * 1[Credit ≥ 20%]	**1.439****
	(2.019)
Remittance unpredictability	6.794*
	(1.910)
Private credit-to-GDP ratio	-0.169*
	(-1.798)
Initial real GDP per capita	-19.77**
	(-2.226)
Real GDP per capita growth volatility	0.162**
	(2.165)
Income inequality	0.839***
	(3.619)
Net Emigration rate	0.631
	(1.117)
Government consumption-to-GDP ratio	15.20**
	(2.089)
Foreign direct investment-to-GDP ratio	-0.161
	(-0.816)
Inflation rate	-0.0131
	(-0.0127)
Education level	-0.132
	(-0.661)
Trade openness	-0.0339
	(-0.535)
Rural population rate	-0.432
	(-0.766)
Observations	152
R-squared	0.248
F-stat Remittance instrumentation: *P*-value	0.046
F-stat Remittances * **1**[Credit ≥ 20%]: *P*-value	0.000
Joint significance of remittance coefficients: *P*-value	0.038
Number of countries above the threshold	21
Percentage of countries above the threshold (%)	64%
Number of countries	33

Notes: Robust *T*-statistics in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Appendix A: Measuring the prevalence of working poor, descriptive statistics and list of countries

Working poor definition

Working poor are defined as employed persons living in households in which per-capita income/expenditure is below the poverty line (Majid, 2001; Kapsos, 2005). The poverty is defined at the household level while employment status is defined at the individual level. In order to maximize comparability across countries, international poverty lines are used, whereby prices in local currencies are converted using purchasing power parity exchange rates and adjusting for inflation. Employment status is determined at the individual level.

How to compute working poverty estimates

If we had direct measures such as the poverty rate of working age population, labor force participation rate of poor, unemployment rate of poor, the estimate of the number of working poor would be:

$$w_p = pop_{poor} * LFPR_{poor} * (1 - U_{poor}) \qquad (1)$$

Where w_p, pop_{poor}, $LFPR_{poor}$ and U_{poor} are respectively the number of working poor, the working age population of poor, the labor force participation of poor and the unemployment rate of poor. However, due to the fact that the joint distribution with population share, labor force and unemployment rate of poor are not known, the following three assumptions are made:

- The poverty rate of working age population is equal to that of the population as a whole
- Labor force participation rate of poor is equal to that of population as a whole
- Unemployment rate of poor is negligible

This latter assumption is fully discussed in Majid (2001).

According to the above assumption, the formula used to compute working poverty is:

$$w_p = povertyrate * employed$$

Selected resources

Majid, N. (2001), The size of the working poor population in Developing Countries, Employment Paper, 2001/16, Geneva, ILO

Kapsos, S. (2004), Estimating Growth Requirements for Reducing Working Poverty: Can the World Halve Working Poverty by 2015, Employment Strategy Papers, 2004/14

ILO (2009) Key Indicators of the Labour Market (KILM), 6th Edition, International Labour Organization, www.ilo.org/KILM

Table A1: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Percentage of working poor	385	48.06	31.02	0	95
Remittance-to-GDP ratio	364	3.22	4.60	0	22.84
Remittance unpredictability	237	0.28	0.32	0.01	1.55
log Real GDP per capita in host countries	433	9.65	0.95	6.45	10.71
log Real GDP per capita	432	8.21	0.83	5.89	9.69
Real GDP per capita growth volatility	417	6.01	13.09	0.07	115.11
Net emigration rate	440	1.03	3.15	-24.02	28.39
Private credit-to-GDP ratio	373	25.64	24.15	1.14	165.96
Trade openness	431	73.19	38.12	14.78	222.29
Government consumption-to-GDP	437	19.47	8.74	3.73	57.41
Net FDI inflows-to-GDP	434	3.08	3.61	-6.95	30.93
Education level (% of people having completed the secondary level)	359	16.86	12.07	0.62	62.93
Income inequality (Gini)	397	43.84	9.46	16.80	74.30
log (1 + inflation/100)	403	0.16	0.32	-0.05	3.01
Rural population (% total population)	440	50.43	21.66	7.36	93.34

Table A2. Countries in the sample (85)

Albania	China	Honduras	Mongolia	Suriname
Angola	Colombia	India	Morocco	Tajikistan
Argentina	Costa Rica	Iran	Mozambique	Thailand
Armenia	Cote d'Ivoire	Jordan	Namibia	Togo
Azerbaijan	Croatia	Kazakhstan	Nepal	Trinidad and Tobago
Bangladesh	Dominican Rep.	Kenya	Nicaragua	Tunisia
Belarus	Ecuador	Kyrgyz Rep.	Niger	Turkey
Benin	Egypt	Lao PDR	Nigeria	Uganda
Bolivia	El Salvador	Lesotho	Pakistan	Ukraine
Bosnia and Herz.	Ethiopia	Liberia	Panama	Venezuela
Botswana	Gambia	Macedonia	Paraguay	Yemen
Brazil	Georgia	Madagascar	Peru	Zambia
Burkina Faso	Ghana	Malawi	Philippines	
Burundi	Guatemala	Malaysia	Russian Fed.	
Cambodia	Guinea	Mali	Rwanda	
Cameroon	Guinea-Bissau	Mauritania	Senegal	
Cape Verde	Guyana	Mexico	Sierra Leone	
Chile	Haiti	Moldova	Sri Lanka	

Chapter 2. Remittances and household consumption instability[24]

[24] A version of this chapter was published under the reference: Combes, J-L. and Ebeke, C. (2011) Remittances and household consumption instability in developing countries, *World Development*, 39 (7), forthcoming.

2.1. Introduction

The recent economic crisis has led policymakers and economists to rethink the instruments of economic stabilization. One of the most damaging consequences of output shocks is the consumption instability, which negatively affects risk adverse agents' welfare.[25] As Athahasoulis and van Wincoop (2000) and Pallage and Robes (2003) point out, consumption instability can have detrimental consequences for the accumulation of human and physical capital.

Consumption instability is driven by a complex array of factors (Wolf, 2004): economic shocks, the determinants of the household income elasticity with respect to shocks and the determinants of the household consumption elasticity with respect to household income. Several characteristics of countries shape consumption instability. Economic size plays a crucial role: large economies with diversified production structures are more immune to both sector-specific shocks and—reflecting the negative association between size and openness—external shocks. Financial development opens new diversification opportunities and dampens consumption instability. The effect of shocks on macroeconomic instability depends on the extent to which participation in the international goods and asset markets allows for specialization and risk diversification. Fiscal policy can be used to offset shocks and smooth consumption, but large fiscal imbalances are also a factor of macroeconomic instability. Fiscal policy instability may in fact be linked to consumption instability through the connection between public and household budgets (Herrera and Vincent, 2008).

It is surprising that remittances are not addressed in the literature examining consumption instability, even though several papers have recently analyzed the potential stabilizing impact

[25] The literature on macroeconomic determinants of output instability in developing countries has pointed out four main factors: financial sector development (Easterly et al., 2000; Ahmed and Suardi, 2009); openness (Kose et al., 2003; Di Giovanni and Levchenko, 2009); and fiscal policy (Fatas and Mihov, 2003).

of migrants' remittances (Chami et al., 2009a; Bugamelli and Paternò, 2009, 2011; IMF, 2005, and World Bank, 2006). The literature has focused on the low procyclicality and perhaps the counter-cyclicality of remittances with respect to GDP. Unlike other private capital flows, remittances tend to be hedges against shocks.

Two mechanisms through which remittances may affect household consumption instability can be put forward. First, remittances might act as an ex-ante risk management mechanism (risk avoidance). For instance, the remittance-receiving households in Burkina Faso and Ghana have houses built of concrete rather than mud and have greater access to communications, making them less prone to natural shocks. Moreover, Ethiopian remittance-receiving households rely more on cash reserves than the sale of productive assets during food crisis episodes (Mohapatra et al. 2009). Remittances constitute a resilience factor at the household level that contributes to protecting the productive capacity through ex-ante investments, thereby smoothing income and promoting economic growth.

Second, remittances may reduce household consumption instability through their contribution to ex-post risk management (insurance). According to Mohapatra et al. (2009), remittances rise when the recipient economy suffers a natural disaster. Yang (2008) also provides cross-country evidence on the response of international flows to hurricanes and concludes that for poorer countries, increased hurricane exposure is associated with greater remittance flows as well as greater foreign aid. By contrast, other private flows (commercial lending, FDI, and portfolio investment) actually decline in response to hurricane exposure.

The stabilizing effect of remittances may be nonlinear. In other words, the marginal stabilizing impact may be stronger in some countries than in others for several reasons. On the one hand, remittances may smooth consumption more in less financially developed countries because the marginal benefit of remittances received by households increases with lower

levels of financial development.[26] On the other hand, there is some evidence that the macroeconomic effects of remittances in the recipient economies may depend on the size of the remittance flows. Several explanations have been proposed. Chami et al. (2008), using a stochastic dynamic general equilibrium model with endogenous labor supply, showed that a high remittance-to-GDP ratio may actually enhance output instability due to the negative impact of these flows on the labor supply of remittance-dependent households. Chami et al. (2009a) have used a cross-countries approach to highlight the diminished stabilizing effect of remittances on output when the flows exceed a 2% of GDP threshold. According to Abdih et al. (2008), a high remittance-to-GDP ratio may actually lead to more corruption. Other authors have shown that higher levels of remittances lead to the appreciation of the real exchange rate (Dutch Disease) in developing countries (Bourdet and Falck, 2006; Amuedo-Dorantes and Pozo, 2004; Lartey et al., 2008).

Therefore, this paper tries to answer several questions concerning the contribution of remittances to household consumption instability. (i) Do remittances significantly reduce the level of household consumption instability? (ii) What are the types of shocks that remittances insure against? (iv) Do the households' financial constraints reinforce the stabilizing effect of remittances? (v) Is there a threshold level of remittances beyond which their stabilizing impact diminishes?

A large cross-sectional panel of developing countries was constructed. To deal with the endogeneity of remittances, the System-GMM-IV was used in this paper. It allows instrumentation of remittances by their lagged value as well as two external instruments: the remittances ratio received by neighbor countries and the weighted GDP per capita of

[26] Giuliano and Ruiz-Arranz (2009) have tested the nonlinear impact of remittances on growth conditional to the financial development. They found that remittances increase economic growth more in less financially developed countries.

migrants' host countries. First, we found that remittances significantly reduce household consumption instability. Second, remittances appear to be a hedge against natural disasters, agricultural shocks, discretionary fiscal policy, financial and systemic banking crises and exchange rate instability. Third, remittances work better in the less financially developed countries. Fourth, when remittances are too high, their stabilizing impact on consumption is weakened. These results are robust to alternative measures of remittances and financial development.

The rest of the chapter is organized as follows: Section 2 is devoted to the econometric investigation of the relationship between remittances and household consumption instability. In Section 3, the hypothesis of the insurance role played by remittances when households are faced with various types of shocks is tested. The issue of nonlinear effects in the impact of remittances on consumption instability is addressed in Section 4. Robustness tests are presented in Section 5, and Section 6 concludes.

2.2 Do remittances reduce household consumption instability?

2.2.1. The econometric model

The following dynamic panel model that captures the impact of remittances on consumption instability was estimated:

$$\sigma^{c}_{i,\tau} = \alpha + \rho\sigma^{c}{}_{i,\tau-1} + X'_{i,\tau}\beta + \phi_1 R_{i,\tau} + \nu_i + \eta_\tau + \varepsilon_{i,\tau} \qquad (1)$$

where $\sigma^{c}_{i,\tau}$ is the standard deviation of the real consumption per capita growth rate estimated over five years. For the purposes of the rest of the paper, we define this variable to be

consumption instability.[27] Table 2.1 presents the evolution of consumption instability. Sub-Saharan Africa is most affected by the consumption instability. Moreover, a declining trend in consumption instability can be observed from 1980–1985 to 2000–2004.

Figure 2.1 shows the distribution of regional averages of consumption instability and the remittances ratio. It seems difficult to conclude that there is a negative correlation between remittances and consumption instability, given that the regions with low (high) remittances are not always those with high (low) consumption instability. However, Sub-Saharan Africa is characterized by both low levels of remittances and high consumption instability. These observations could be a symptom of the conditional effects of remittances on consumption instability that this econometric analysis attempted to reveal.

i and τ represent the country and the nonoverlapping five-year period, respectively. ν_i and η_τ represent the country and period fixed effects, respectively. The former was included to control for time invariant heterogeneity, and the later was included to control for common shocks at each period among countries in the sample. ε is the idiosyncratic error term. It is worth noting that estimation using panel data allows for the exploitation of the time series nature of the relationship between remittances and consumption instability. Since the magnitude of remittance inflows has changed substantially over time, this is an important advantage. The data were organized into a panel consisting of at most 87 countries over the period 1975–2004. The data were averaged over nonoverlapping five-year periods so that—data permitting—there are six observations per country (1975–1979, 1980–1984, 1985–1989, 1990–1994, 1995–1999, and 2000–2004).

[27] Two arguments justify the use of the standard deviation of growth rates as a measure of instability. First, given that macroeconomic variables are often nonstationary, computing the growth rate is a way to remove the trend. Second, it is now common in the macroeconomic consequences of remittances literature to approximate instability by the standard deviation of the growth rate (e.g. IMF, 2005; Chami et al., 2008; Bugamelli and Paternò, 2009b).

R is the remittances variable, measured as the ratio of remittances to GDP. We followed the World Bank by defining this variable as the sum of workers' remittances and compensation of employees. Moreover, we primarily used the sum of these two variables because for many developing countries the statistical distinction between the two can be highly problematic (Bugamelli and Paternò, 2011). Nevertheless, following the narrow definition of remittances (Chami et al., 2009b)—which excludes compensation of employees —an alternative measure was employed in Section 5. Whenever the ratio of remittances to GDP seemed more relevant to capturing the economic importance of these flows in a country, an alternative measure of remittances per capita was used in Section 5.

X is a matrix of control variables that includes the following:[28]

• Per capita income growth instability. This variable is measured by the standard deviation of the real GDP per capita growth rate over five-year subperiods; we expected a positive marginal impact that catches aggregate shocks on consumption instability for this variable (Herrera and Vincent, 2008).

• Per capita income. Consumption instability is expected to be lower in more developed countries (Auffret, 2003; Bekaert et al., 2006). We included the logarithmic term GDP per capita at the beginning of each period.

• Financial development. The degree of consumption smoothing could depend on the depth and the efficiency of financial markets (Bekaert et al., 2006; Ahmed and Suardi, 2009). It seems plausible that consumption smoothing is strongly determined by the availability of credit; hence, the ratio of bank-provided private sector credit to GDP was assumed to be a measure of financial development. However, as a robustness check in Section 5, we also

[28] The definition of variables, sources of data and descriptive statistics are presented in Appendix.

defined financial development as the ratios of deposits to GDP and broad money (M2) to GDP.

• Trade and financial openness. The literature on trade openness and macroeconomic instability likewise combines theoretical ambiguity with varied empirical findings. Enhanced real integration can lead to greater sectional specialization but also provides greater diversification across demand sources (Di Giovanni and Levchenko, 2009). On the one hand, financial openness increases the degree of exposure to world financial crises. On the other hand, financial openness offers new portfolio diversification opportunities. Trade openness was measured as the ratio of exports and imports of goods and services to GDP. Financial openness was measured as the Chinn-Ito index (2008), rescaled to obtain only positive values. This index is introduced in a quadratic form to capture a threshold effect (Kose et al., 2003).

• Government size. In developing countries, large government size (measured by the ratio of government consumption to GDP) could generate macroeconomic instability and economic inefficiencies. We therefore expected a positive correlation between this variable and consumption instability (Bekaert et al., 2006).[29]

• Foreign aid. Foreign aid may enhance the risk management mechanism. Moreover, countercyclical aid plays an insurance role. Aid is measured by the ratio of official development assistance to GDP.

• Lagged level of consumption instability. This variable catches the strong inertia which characterizes the dynamics of consumption instability.

If remittances increase as the vulnerability of the economy to shocks is increasing, the Ordinary Least Squares (OLS) estimator for ϕ_1 is biased upward. Moreover, the OLS estimator is inconsistent because the lagged dependent variable is correlated with the error

[29] This effect strongly differs from what we can expect in developed countries where government spending is often countercyclical rather than procyclical, as it is in developing countries.

term due to the presence of fixed effects. Hence, an econometric strategy based on instrumental variables must be implemented. The equation in levels and the equation in first differences are combined in a system and estimated with an extended System-GMM estimator that allows for the use of lagged differences and lagged levels of the explanatory variables as instruments (Blundell and Bond, 1998).[30] The GMM estimator controls for the endogeneity of the remittances and other explanatory variables.[31]

Two external instruments were added: the ratio of remittances to GDP for all other recipient countries located in the same region and the log-weighted GDP per capita for each of the migrant host countries (Aggarwal et al., 2011; Acosta et al., 2009).[32] External instruments weaken the potential "weak instruments" problem that often arises in the context of traditional GMM estimation.

Two specification tests were used to check the validity of the instruments. The first was the standard Sargan/Hansen test for overidentifying restrictions. The second test examined the hypothesis that there is no second-order serial correlation in the first-differenced residuals. The diagnostic tests do not invalidate the quality of the instrumentation within the System-GMM framework.

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[30] The paper uses the System-GMM estimator developed by Blundell and Bond (1998) for dynamic panel data with the Windmeijer (2005) correction for finite sample bias.

[31] In all specifications, only period dummies and initial GDP per capita are taken as strictly exogenous.

[32] Chami et al. (2008) first computed this instrument for migrants' remittances. They retained the ratio of remittances to GDP for all other recipient countries as an instrument. We followed their work, but we retained the remittances of all other neighbors. This variable captures various trends in remittances throughout regions of the world, including changes in transactions costs, and at the same time should not directly affect consumption instability. The instrument excludes the remittance-to-GDP ratio of the country in question, thereby freeing it of a direct causal link with other domestic macroeconomic and policy variables that also influence consumption instability. We also computed the GDP per capita in the migrants' host countries by weighting the GDP per capita of all other countries by the share that each of these countries represents in the emigration of workers of developing countries. The bilateral migration matrix used to make calculations was drawn from the World Bank web site:
http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTDECPROSPECTS/0,,contentMDK:21154867~pagePK:64165401~piPK:64165026~theSitePK:476883,00.html

2.2.2. The preliminary results

The results are presented in Table 2.3. The baseline model, estimated using both OLS with country fixed effects (column 1) and the System-GMM (column 2), included the lagged values of the dependent variable, trade openness, government consumption, initial level of development and migrants' remittances. The two biases associated with the OLS estimator when applied to a dynamic model were confirmed. The coefficient of the lagged consumption instability is biased towards 0 and the coefficient of the remittance variable suffers from an upward bias.[33] As expected, remittances significantly reduced consumption instability. Trade openness, government consumption and lagged dependent variables amplify consumption instability. By contrast, per capita income negatively and significantly affects consumption instability. The signs of the control variables are consistent with early studies (Bekaert et al., 2006; Herrera and Vincent, 2008).

The next step consisted of adding a battery of control variables to check the robustness of these results to changes in the following model specifications (see columns 3-9): financial development, financial openness, foreign aid, and GDP per capita instability. Whatever controls are introduced, the coefficient for migrants' remittances remains strongly significant, negative and relatively stable. Financial development contributes to consumption smoothing (column 3). It appears that GDP per capita instability is a significant source of consumption instability. As in Kose et al. (2003), financial openness is related to consumption instability in an inverted U relationship; the benefits of financial integration only appear beyond a given threshold (columns 6 and 9). Foreign aid does not significantly reduce consumption instability (columns 7, 8, and 9).

[33] The coefficient obtained with the OLS estimator is, in absolute value, 50% of the corresponding coefficient obtained with system-GMM. Even when the model is estimated with the full set of control variables (column 8), this bias still remains.

2.3. What shocks are mitigated by remittances?

The following equation was estimated to test the hypothesis that remittances insure differently against natural disaster, agricultural and discretionary fiscal policy shocks, financial and banking crisis, nominal exchange rate shocks and inflation shocks (*Sh*):

$$\sigma^{c}_{i,\tau} = \alpha + \rho\sigma^{c}{}_{i,\tau-1} + \phi_1 R_{i,\tau} + \phi_2\left(R_{i,\tau} \times Sh_{i,\tau}\right) + \phi_3\left(R_{i,\tau} \times M_{i,\tau}\right) + \delta_1 Sh_{i,\tau} + \delta_2 M_{i,\tau} + X'_{i,\tau}\beta + \nu_i + \eta_\tau + \varepsilon_{i,\tau} \quad (2)$$

In other words, the aggregate shock (GDP per capita instability) was broken-down into several sources of GDP instability.[34] The strategy consisted of identifying the stabilizing impact of remittances against specific shocks (*Sh*) while controlling for the impact of *other* shocks (*M*).[35] This strategy allowed ranking the stabilizing impact on various shocks. ϕ_1 captures the stabilizing impact of remittances (*R*) when *Sh* and *M* both equal 0. There is no specific claim for the sign of ϕ_1, given that in a world without shocks (*M* = *Sh* = 0) the insurance role of remittances could disappear. By contrast the insurance role of remittances implies a negative sign for ϕ_2 and ϕ_3. The destabilizing effect of shocks on consumption means that δ_1 and δ_2 are both positive. When δ_1 and ϕ_2 have opposite signs, a threshold level of remittances arises:

$$\frac{\partial\sigma^{c}_{i,\tau}}{\partial Sh_{i,\tau}} = \delta_1 + \phi_2 R_{i,\tau} = 0 \Rightarrow R^{*} = -\frac{\delta_1}{\phi_2}$$

where R^{*} measures the minimum remittance ratio required for a full absorption of the shocks.

[34] We thank an anonymous referee who suggested expanding the set of shocks by including financial crisis, inflation and exchange rate shocks.

[35] For each type of shock, *M* is the residual of an OLS regression with two fixed effects (country and period) for GDP per capita instability on the corresponding shock (*Sh*). Although *M* is a generated variable, there is no problem of statistical inference, given that this variable is a residual (Pagan, 1984).

The natural disaster data were drawn from Center for Research on the Epidemiology of Disasters (CRED), Emergency Events Database (EM-DAT).[36] CRED defines a disaster as a natural situation or event, which overwhelms local capacity, necessitating a request for external assistance (Noy, 2009; EM-DAT Glossary of terms).[37] We considered all disaster events taken together within a country in a year rather than each of them examined separately. Indeed, different regions in a country can be affected by different types of disasters in a given year; because remittances data is available only at annual frequency and at the country level, we would not be able to separate the response of remittances to a specific disaster (Mohapatra et al., 2009). The reported measure of the total number of people affected is used. The number of people affected is divided by the total population in the year prior to the disaster year (Noy, 2009; Mohapatra et al., 2009).

Agricultural, nominal exchange rate and inflation shocks were measured by the standard deviations over five years of agricultural value added over GDP, nominal effective exchange rate and consumer price index growth rates, respectively. Fiscal shocks were measured by the standard deviation of the residual component of the log difference of government consumption from an econometric model of the former over the log difference of GDP, with a time trend and inflation in a quadratic form (Fatas and Mihov, 2003).[38] We took advantage of the recent database of Laeven and Valencia (2010) to model financial and banking crises. We

[36] The Center for Research on the Epidemiology of Disasters (CRED) has collected and made publically available worldwide data on the occurrence and effects of natural disasters from 1900 to the present. The database is compiled from various sources, including UN agencies, nongovernmental organizations, insurance companies, research institutions and press agencies. The EM-DAT data are publicly available on CRED's web site at: www.cred.be.

[37] These disasters can be grouped into several categories: meteorological disasters (floods, wave surges, storms, droughts, landslides and avalanches); climatological disasters (disasters caused due to long run or seasonal climatic variability such as drought, extreme temperatures and wild fire); and geophysical disasters (earthquakes, tsunamis and volcanic eruptions).

[38] Current output growth was instrumented with two lags of GDP growth and lagged inflation. We included inflation to ensure that the results were not driven by high-inflation episodes in which the co-movement between real government spending and output might be due to monetary instability rather than fiscal policy. Inflation squared was included to control for a possible nonlinear relationship between inflation and spending. The model was estimated for each country separately.

used both a dummy variable for the occurrence of a crisis and a continuous variable for output losses due to the crisis (see appendix data definition for more details).

The results are presented in Table 2.4. In most cases, after controlling for the stabilizing impact of remittances on other shocks, the coefficients associated with the interaction terms (remittances crossed with each type of shock) are negative and highly significant. The additively introduced shocks variables are, as expected, positively and significantly related to consumption instability. Inflation is the sole exception (column 7). Moreover, whatever the specifications, the coefficients of specific shocks and of remittances interaction terms are *jointly* significant. Therefore, we were able to compute the threshold level of remittances ratios that fully absorb the shocks. The range of the thresholds runs from 5% of GDP for the exchange rate shocks to 16% for the agricultural shocks. It appears that the full absorption of natural disasters (column 1) and agricultural shocks (column 2) requires much higher levels of remittances: 10% and 16%, respectively. A partial explanation for this finding can be put forward. Natural disasters and agricultural shocks hit a large fraction of the population in developing countries and are more recurrent. Hence, the required level of remittances is higher. This fact is reinforced by the importance of the financial constraints that characterize a number of countries in the developing world.

In column 8, we test the stabilizing impact of remittances in the presence of aggregate instability (GDP per capita instability). The result indicates that the positive effect of GDP per capita instability on consumption instability decreases with the level of remittance inflows. Nevertheless, we notice that a huge ratio of remittances (21% of GDP) is required to fully stabilize consumption in the case of aggregate volatility.

2.4. Heterogeneities in the levels of financial development and remittances: testing for nonlinearities

This section is devoted to the identification of potential heterogeneities in the relationship between remittances and consumption instability. First, we focus on the stabilizing impact conditional on the financial constraints. Second, we analyze whether the level of remittances could modify the marginal impact of remittances on consumption instability.

2.4.1. Do remittances stabilize more in less financially developed countries?

We first estimated the following model:

$$\sigma^{c}_{i,\tau} = \alpha + \rho\sigma^{c}{}_{i,\tau-1} + \phi_1 R_{i,\tau} + \phi_2\left(R_{i,\tau} \times FD_{i,\tau}\right) + \delta FD_{i,\tau} + X'_{i,\tau}\beta + \nu_i + \eta_\tau + \varepsilon_{i,\tau} \quad (3)$$

where FD, a proxy for the level of financial development, represents the ratio of bank credit to GDP[39]. X' is the vector of control variables. The hypothesis is that $\phi_1 < 0$ and $\phi_2 > 0$; so, the impact of migrants' remittances $\phi_1 + \phi_2 FD_{i,\tau}$ is more stabilizing at low levels of financial development. Moreover, when ϕ_1 and ϕ_2 have opposite signs, a threshold effect arises:

$$\frac{\partial\sigma^{c}{}_{i,\tau}}{\partial R_{i,\tau}} = \phi_1 + \phi_2 FD_{i,\tau} = 0 \Rightarrow FD^{*} = -\frac{\phi_1}{\phi_2}.$$

The results are presented in Table 2.5. In column 1, few control variables are introduced. The nonlinear relationship hypothesis is not rejected. The marginal stabilizing impact of remittances decreases with the level of financial development. This result holds whatever the set of control variables (column 2 with GDP per capita instability and column 3 with GDP per

[39] In Section 5, we mobilize alternative measures of financial development to check the robustness of the nonlinearity assumption.

capita instability and financial openness). Moreover, the test of the joint significance of ϕ_1 and ϕ_2 rejects the hypothesis that there is no nonlinearity. It also appears that the higher the level of private credit available, the lower the consumption instability. From column 3, the threshold level of private credit that ensures the marginal impact of remittances on consumption instability is negative stands at 30% of GDP. Also, 78% of the countries have levels consistent with an overall stabilizing impact of remittances on consumption.

While a reinforced stabilizing effect for remittances in less financially developed countries is intuitive, the opposite conclusion (remittances leading to an instability of consumption in high financially developed countries) is more striking. Three partial explanations can be proposed. First, remittances may be strongly procyclical in highly financially developed countries and so exacerbate business cycles and fuel consumption instability. However, recent papers seem to invalidate this conjecture (Giuliano and Ruiz-Arranz, 2009). Second, the insurance role of remittances may be reduced in highly financially developed countries because households can resort to the banking system to smooth their consumption. Moreover, in this context, remittances could then primarily finance the purchase of land and housing and therefore contribute to a boom in the real estate sector. Hence, remittances inflows may affect the consumption patterns of both the remittance-receiving and nonremittance-receiving households in the community. This mechanism is reinforced when banks recognize remittances as a form of collateral, which can increase the availability of loans.[40]

An alternative model for this nonlinearity that needed to be tested was implemented with rolling estimations for the different values taken by the ratio of private credit. A new variable, d_{FD}, in interaction with the remittances variable was specified; d_{FD} is equal to 1 if the country has a private credit ratio greater than $FD*$ and 0 otherwise. This methodology for

[40] We thank an anonymous referee for providing us with explanations of this result.

threshold determination in the case of endogenous regressors in a System-GMM framework has previously been implemented by Masten et al. (2008) and Chami et al. (2009a).[41] The following equation is specified:

$$\sigma^{c}_{i,\tau} = \alpha + \rho\sigma^{c}{}_{i,\tau-1} + \phi_1 R_{i,\tau} + \phi_2 \left(R_{i,\tau} \times d_{FD}\right) + \delta FD_{i,\tau} + X'_{i,\tau}\beta + \nu_i + \eta_\tau + \varepsilon_{i,\tau} \quad (4)$$

with $d_{FD} = \mathbf{1}[FD \geq FD^*]$.

The top 5% and bottom 5% of the observations of the private credit ratio were dropped to ensure feasible identification of the threshold. Private credit thresholds were explored in increments of 0.5 percent. Each equation corresponding to a different threshold was estimated by the System-GMM method. Under the System-GMM framework, the optimal threshold is the one that maximizes the overidentification Hansen test p-value. Testing nonlinear effects simply refers to the test of the null hypothesis that the coefficient for the interactive variable ϕ_2 is equal to zero. The results of the simulations are presented in Figure 2.2. The first graph shows the evolution of the coefficient ϕ_2 (the 95% confidence interval for the coefficient is shown by dotted lines) and the second graph shows the statistical significance of this coefficient. The third graph gives the Hansen test p-value for each model.

As expected, in most cases ϕ_2 is positive. The optimal cutoff, which maximizes the Hansen test p-value, is a private credit ratio of 20.03%. The corresponding estimation is shown in Table 2.6. All the diagnostic tests associated with the System-GMM estimator validate the specification.

The role of migrants' remittances in enhancing the ability of households to smooth consumption is effective up to a private credit ratio of 20.03% (which is obtained in 55% of

[41] Another approach might consist of estimation using the Hansen methodology with the assumption that the threshold variable is exogenous. Private credit ratio cannot be considered as strictly exogenous, however.

the countries). However, this value for the private credit ratio threshold is different from that estimated in model 5, in which we found a value of 30%. This difference arises because rolling estimations allow for the determination of an optimal threshold identified among a wide range of potential thresholds. So, this result is preferred to the previous one.

2.4.2. Does the stabilizing impact of remittances depend upon the level of remittances?

We tested the hypothesis of a threshold for remittances beyond which the impact on consumption instability may be weakened.

We used the same methodology to allow for the endogenous determination of the threshold. The following equation was specified:

$$\sigma^{c}_{i\tau} = \alpha + \rho\sigma^{c}{}_{i,\tau-1} + X'_{i\tau}\beta + \phi_1 R_{i\tau} + \phi_2 \left(R_{i\tau} \times d_r\right) + \nu_i + \eta_\tau + \varepsilon_{i\tau} \qquad (5)$$

with $d_r = \mathbf{1}[R \geq R^*]$.

The variable d_r is equal to 1 if the country has a value of remittances greater than R^* and 0 otherwise. The results are presented in Figure 2.3.

The optimal value of the remittances ratio is 5.5%. Table 2.7 presents the estimation of the model on the basis of the endogenously determined threshold.

When remittances exceed 5.5% of GDP (13 countries, 17% of the sample), the marginal stabilizing impact becomes weaker.[42] Compared to the 2% threshold computed by Chami et al. (2009) from an equation of output instability, the results suggest a high value of remittance ratio at which a much weaker stabilizing effect on consumption is observed. The permanent

[42] The stabilizing impact is weaker in the following countries: Albania, Armenia, Cape Verde, Dominica, Dominican Republic, Egypt, El Salvador, Jordan, Lesotho, Moldova, Morocco, Swaziland and Vietnam. These countries exhibit a median value for consumption instability that is 1.5 times larger than the median value for the rest of the sample.

income hypothesis, which posits that consumption is less volatile than income, can provide an explanation. So, remittances need to be very high to lead to consumption instability, but a much lower level of remittances is sufficient to generate GDP instability.

2.5. Robustness checks

Two robustness checks were implemented. First, the stabilizing contribution of remittances conditional on the level of financial development was reexamined with alternative measures of the level of financial development (Table 2.8). Two commonly used indicators were tested: the bank deposits ratio (column 1) and the broad money ratio (M2/GDP, column 2). Whatever indicators used, the result that the marginal stabilizing impact of remittances decreases with the level of financial development still held. Moreover, the level of financial development negatively affected consumption instability in all specifications.

Second, two alternative measures of remittances were employed: real remittances per capita (log-scaled) and remittances net of employee compensation (% of GDP).[43] The results are presented in the Table 2.9. The first three columns concern the real remittances per capita. In column 1, it appears that the stabilizing impact of remittances on consumption is still preserved even with the alternative measure. In column 2, the decreasing marginal stabilizing impact of remittances with increased financial development seen previously still holds. In column 3, the contribution of remittances as an insurance mechanism caught by the coefficient of the interaction term of remittances with GDP per capita instability remains highly significant. The last three columns repeat the same exercise with remittances net of employee compensation. The results are qualitatively unchanged.

[43] Remittances in nominal US dollars were converted to constant dollars by dividing the series by the consumer price index of each country.

2.6. Concluding remarks

This chapter analyzed the relationship between migrants' remittances and consumption instability. Using a large sample of developing countries over the period 1975–2004 and controlling for the endogeneity of remittances, the econometric results suggest that remittance-recipient countries exhibit on average lower consumption instability. Remittances appear to be a hedge against various types of macroeconomic instability: natural disaster, agricultural shocks, discretionary fiscal policy, systemic banking crisis and exchange rate instability. However, the results highlight some important heterogeneities among recipient countries: the marginal stabilizing impact of remittances significantly decreases with the levels of financial development and remittances ratios. More precisely, the stabilizing impact is weakened when the private credit ratio exceeds 20% of GDP and when the remittance ratio is above 6% of GDP.

The stabilizing impact of remittances enters the debate about the effect of economic financial globalization on macroeconomic volatility and welfare. Previous papers have primarily focused on the effect of financial and trade openness on consumption instability (Rose and Spiegel, 2009; Kose et al., 2003; Dell'Ariccia et al., 2008; Di Giovanni and Levchenko, 2009). In this paper, we examined another aspect of economic globalization by looking at the effects of remittances on consumption instability. The paper suggests that some countries enjoy much greater stabilization from remittance inflows than others. This complexity must be factored into any analysis of the developmental implications of remittances and cautions against naïve recommendations in favor of huge remittance inflows in all situations.

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Table 2.1: Household consumption instability in developing countries

	Five-years subperiods						
Regions	1975–1979	1980–1984	1985–1989	1990–1994	1995–1999	2000–2004	**Average**
East Asia and Pacific	2.87	4.70	5.52	3.33	4.80	1.96	3.80
Europe and Central Asia	..	..	3.85	9.23	7.82	4.81	6.28
Latin America and Caribbean	7.39	7.62	6.03	6.02	5.06	3.56	5.90
Middle East and North Africa	6.19	4.92	6.38	6.29	4.29	3.09	5.01
South Asia	6.35	3.66	2.47	3.10	5.80	2.83	4.01
Sub-Saharan Africa	8.32	7.96	10.11	9.49	7.03	6.38	8.16
Average	7.18	6.97	7.70	7.41	6.11	4.62	6.50

Table 2.2 : Descriptive statistics

Variables	Obs	Mean	Std. Dev	Min	Max	1st order autocorrelation coefficient
Instability of household consumption per capita	434	6.49	5.42	0.20	43.67	0.56*
Remittances (% GDP)	513	3.98	8.30	0	80	0.92*
Remittances *net* of compensations (% GDP)	550	2.31	4.52	0	33.15	0.90*
Real remittances per capita $US	452	79.13	179.42	0	1345.62	0.64*
Private credit ratio	523	22.35	18.93	0.41	145.31	0.89*
Private banks deposit (% GDP)	528	26 .84	20.20	0	121.23	1.08*
M2 (% GDP)	626	34.44	24.47	4.10	198.24	1.07*
GDP per capita instability	600	4.09	3.37	0.25	32.19	0.31*
Discretionary fiscal policy	425	10.74	11.44	0.77	91.69	0.58*
Agricultural value added instability	553	9.92	8.07	0.48	61.38	0.38*
Inflation instability	521	63.50	523.70	0.13	9803.13	0.07
NEER instability	519	11.85	17.78	0.61	208.60	0.10*
Natural disasters	738	1.82	4.05	0	31.76	0.17*
Financial and banking crisis (output losses %)	750	3.43	15.00	0	129.55	0.01
Financial and banking crisis (dummy variable)	750	0.13	0.34	0	1	-0.07
Initial GDP per capita (log)	625	6.77	1.06	4.44	9.02	0.98*
Trade openness	645	73.27	39.43	2.35	226.87	0.92*
Financial openness	629	1.51	1.18	0.18	4.53	0.81*
Government consumption (% GDP)	627	15.68	6.80	2.34	54.37	0.83*
Aid (% GNI)	632	8.01	9.38	-0.02	58.05	0.81*

* significant at 5% level.

Countries (87) : Albania, Algeria, Argentina, Armenia, Azerbaijan, Bangladesh, Belize, Benin, Bolivia, Botswana, Brazil, Bulgaria, Burkina Faso, Cambodia, Cameroon, Cape Verde, Chile, China, Colombia, Comoros, Costa Rica, Cote d'Ivoire, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guatemala, Guinea, Guinea-Bissau, Guyana, Honduras, India, Indonesia, Iran, Jordan, Kazakhstan, Kenya, Lebanon, Lesotho, Macedonia, Madagascar, Malawi, Malaysia, Mali, Mauritania, Mauritius, Mexico, Moldova, Morocco, Mozambique, Namibia, Nicaragua, Oman, Pakistan, Panama, Paraguay, Peru, Philippines, Romania, Russia, Rwanda, Senegal, Seychelles, Slovak Rep., South Africa, Sudan, Swaziland, Syrian A.R., Tajikistan, Tanzania, Thailand, Togo, Tunisia, Turkey, Uganda, Ukraine, Uruguay, Venezuela, Vietnam, Zambia, Zimbabwe.

Table 2.3: Impact of remittances on consumption instability

	OLS-FE							OLS-FE	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Remittances (% GDP)	-0.119***	-0.242***	-0.230***	-0.261***	-0.241***	-0.272***	-0.236***	-0.166***	-0.278**
	(2.73)	(3.72)	(3.29)	(4.42)	(3.64)	(2.84)	(2.78)	(4.33)	(2.28)
Private credit ratio (% GDP)			-0.052*		-0.057*	-0.045*	-0.037	-0.008	-0.030
			(1.69)		(1.85)	(1.73)	(1.14)	(0.35)	(0.87)
GDP per capita instability				0.407***	0.486**	0.537***	0.405**	0.327**	0.467**
				(2.87)	(2.55)	(2.83)	(2.44)	(2.16)	(2.64)
lag dependent variable	0.017	0.233*	0.235	0.263*	0.230	0.171	0.193	0.051	0.141
	(0.22)	(1.67)	(1.41)	(1.89)	(1.24)	(1.00)	(1.52)	(0.55)	(0.99)
Initial GDP per capita	1.128	-1.628***	-1.140**	-1.603***	-1.047*	-1.076*	-0.207	0.573	-0.467
	(0.80)	(3.10)	(2.01)	(3.29)	(1.97)	(1.82)	(0.26)	(0.26)	(0.43)
Trade openness	0.023	0.058**	0.062**	0.061***	0.063**	0.050*	0.040	0.026	0.036
	(1.42)	(2.50)	(2.42)	(2.75)	(2.55)	(1.84)	(1.37)	(1.32)	(1.03)
Government cons. (% GDP)	0.246*	0.653***	0.584**	0.632***	0.524**	0.470	0.538**	0.193	0.553
	(1.88)	(3.61)	(2.47)	(3.28)	(2.09)	(1.52)	(2.10)	(1.64)	(1.59)
Financial openness						4.683**		0.474	3.998*
						(2.09)		(0.34)	(1.88)
(Financial openness)²						-0.859*		0.074	-0.776*
						(1.94)		(0.20)	(1.87)
Aid (% GDP)							0.160	0.171	0.140
							(1.51)	(1.61)	(0.98)
Constant	-5.247	3.644	2.007	1.993	0.529	-0.505	-4.638	-4.241	-4.843
	(0.56)	(1.02)	(0.51)	(0.60)	(0.15)	(0.10)	(1.00)	(0.29)	(0.84)
Observations	300	294	265	294	265	265	263	269	263
Countries	89	87	77	87	77	77	77	79	77
AR(1):p-value		0.004	0.008	0.004	0.026	0.049	0.013		0.078
AR(2):p-value		0.213	0.322	0.163	0.329	0.254	0.271		0.200
Hansen p-value		0.814	0.681	0.647	0.437	0.161	0.631		0.304
Instruments		18	19	19	20	25	22		26

Note: The estimation method is a two-step System-GMM with Windmeijer (2005) small sample robust correction. Time effects are included in all the regressions. *T*-statistics are below the coefficients. Instability is the five-year standard deviation of the growth rate of the corresponding variable. Data are averaged over six nonoverlapping five-year periods between 1975 and 2004. The dependent variable is consumption instability. *** p<0.01,** p<0.05,* p<0.1

Table 2.4: Remittances, various shocks and consumption instability: Testing for the insurance role

	Natural disasters	Agricultural shock	Fiscal shock	Financial and banking crisis [a]	Financial and banking crisis [b]	Exchange rate shock	Inflation shock	Aggregate shock
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Remittances (% GDP)	-0.053	0.022	0.133	-0.069	-0.156	-0.178**	-0.136**	0.025
	(0.85)	(0.33)	(1.38)	(0.46)	(1.11)	(2.21)	(2.42)	(0.41)
Remittances × *Shock*	-0.015***	-0.011***	-0.026***	-0.010***	-0.629**	-0.023**	0.000	-0.028**
	(2.97)	(4.58)	(4.18)	(3.13)	(2.30)	(2.32)	(0.01)	(2.64)
Remittances × '*Other shocks*'	-0.027**	-0.023**	0.000	-0.002	-0.015	-0.024	-0.042***	
	(2.40)	(2.35)	(0.02)	(0.03)	(0.32)	(1.56)	(3.58)	
Shocks	0.154*	0.179***	0.188*	0.079***	3.218***	0.109*	0.000	0.605***
	(1.68)	(4.09)	(1.83)	(4.85)	(3.07)	(1.72)	(0.25)	(3.16)
'*Other shocks*'	0.432**	0.449***	0.373*	0.375*	0.442**	0.387**	0.580***	
	(2.45)	(2.65)	(1.70)	(1.85)	(2.18)	(2.13)	(2.91)	
Private credit ratio (% GDP)	-0.053**	-0.037	-0.042*	-0.046*	-0.046	-0.062	-0.049*	-0.042*
	(2.20)	(1.59)	(1.73)	(1.84)	(1.31)	(1.61)	(1.67)	(1.68)
lag dependent variable	0.279	0.108	0.223	0.260	0.203	0.177	0.325	0.225
	(1.46)	(0.67)	(1.26)	(1.30)	(1.00)	(1.07)	(1.38)	(1.40)
Initial GDP per capita	-0.216	-1.082*	-0.462	-0.724	-1.296	-1.070**	-0.865	-0.744
	(0.21)	(1.93)	(0.76)	(1.17)	(1.62)	(2.04)	(1.42)	(1.53)
Trade openness	0.051***	0.038*	0.045**	0.039	0.057	0.058**	0.044	0.046*
	(2.70)	(1.76)	(2.29)	(1.45)	(1.43)	(2.25)	(1.62)	(1.83)
Government consumption (% GDP)	0.273	0.380**	0.176	0.223	0.440	0.635*	0.250	0.380
	(1.38)	(2.22)	(0.76)	(0.81)	(1.17)	(1.80)	(1.19)	(1.41)
Financial openness	2.456	3.955**	1.537	3.180*	2.599	3.808	2.891*	3.436*
	(1.45)	(2.22)	(0.84)	(1.69)	(1.04)	(1.58)	(1.75)	(1.82)
(Financial openness) ²	-0.455	-0.775**	-0.309	-0.583*	-0.444	-0.680	-0.433	-0.651*
	(1.33)	(2.25)	(0.84)	(1.68)	(0.88)	(1.49)	(1.25)	(1.71)
Constant	-1.499	1.942	1.790	2.666	3.566	-1.571	3.525	-1.377
	(0.17)	(0.50)	(0.28)	(0.48)	(0.68)	(0.32)	(0.58)	(0.29)
Observations	265	256	264	265	265	258	255	265
Countries	77	77	77	77	77	70	74	77
Joint significance of '*Shocks*' coeff. (p-value)	0.000	0.000	0.000	0.006	0.066	0.044	0.055.	0.022
Remittance ratio required for a 'full stabilization'	10.059	16.216	7.129	7.729	5.114	4.780	..	21.389
Number of countries concerned	5	2	9	7	15	14	..	1
AR(1):p-value	0.028	0.089	0.032	0.031	0.036	0.024	0.049	0.025
AR(2):p-value	0.122	0.213	0.743	0.069	0.164	0.093	0.151	0.148
Hansen p-value:	0.259	0.563	0.315	0.080	0.135	0.554	0.436	0.231
Instruments	29	30	31	30	30	33	33	28

Note: The estimation method is a two-step System-GMM with Windmeijer (2005) small sample robust correction. Time effects are included in all the regressions. *T*-statistics are below the coefficients. Instability is the five-year standard deviation of the growth rate of the corresponding variable. Data are averaged over six nonoverlapping five-year periods between 1975 and 2004. The dependent variable is consumption instability.

[a] represents the consolidated output losses (in % of country total output) due to the financial and systemic banking crisis (Laeven and Valencia, 2010).

[b] represents a dummy variable which takes the value 1 if a there is banking or financial crisis in each country over each of the five-year subperiod (Laeven and Valencia, 2010).

*** p<0.01,** p<0.05,* p<0.1

Table 2.5: Remittances, financial constraints and household instability

	(1)	(2)	(3)
Remittances (% GDP)	-0.279***	-0.337***	-0.427***
	(3.80)	(5.04)	(4.49)
Remittances × Private credit ratio	0.008**	0.012***	0.014**
	(2.11)	(2.81)	(2.48)
Private credit ratio (% GDP)	-0.064**	-0.081**	-0.083**
	(2.14)	(2.52)	(2.20)
GDP per capita instability		0.498***	0.543***
		(2.67)	(2.96)
lag dependent variable	0.267*	0.255	0.165
	(1.71)	(1.52)	(1.01)
Initial GDP per capita	-0.969*	-0.842*	-0.907
	(1.75)	(1.69)	(1.50)
Trade openness	0.059**	0.062***	0.057*
	(2.63)	(2.79)	(1.92)
Government consumption (% GDP)	0.471**	0.395**	0.451
	(2.39)	(2.03)	(1.28)
Financial openness			4.344**
			(2.32)
(Financial openness)²			-0.874**
			(2.30)
Constant	2.293	0.860	-0.999
	(0.58)	(0.24)	(0.21)
Observations	265	265	265
Countries	77	77	77
Joint significance of remittances' coef. (p-value)	0.001	0.000	0.000
Private credit *turning-point* (% GDP)	34.226	28.330	30.566
Countries above the threshold of private credit.	11	22	17
Percentage of countries above the threshold	14	28	22
AR(1):p-value	0.006	0.014	0.053
AR(2):p-value	0.349	0.459	0.368
Hansen p-value	0.812	0.615	0.287
Instruments	21	22	26

Note: The estimation method is two-step System-GMM with Windmeijer (2005) small sample robust correction. Time effects are included in all the regressions. *T*-statistics are below the coefficients. Instability is the five-year standard deviation of the growth rate of the corresponding variable. Data are averaged over six nonoverlapping five-year periods between 1975 and 2004. The dependent variable is consumption instability. *** p<0.01,** p<0.05,* p<0.1

Table 2.6: Remittances, financial constraints and consumption instability: Nonlinear System-GMM method

Remittances (% GDP)	-0.197**
	(2.07)
Remittances × d_{FD} = **1**[$FD \geq 20.03$ %]	0.206**
	(2.28)
Private credit ratio (% GDP)	-0.044
	(1.58)
GDP per capita instability	0.563***
	(3.03)
lag dependent variable	0.230
	(1.42)
Initial GDP per capita	-0.936**
	(2.01)
Trade openness	0.046*
	(1.76)
Government consumption (% GDP)	0.466
	(1.41)
Financial openness	4.216*
	(1.98)
(Financial openness)^2	-0.784*
	(1.90)
Constant	-1.714
	(0.31)
Observations	265
Countries	77
Joint significance of remittances (p-value)	0.047
Threshold of private credit ratio	20.031
Countries above the threshold	35
Percentage of countries above the threshold	45
AR(1):p-value	0.036
AR(2):p-value	0.267
Hansen p-value	0.394
Instruments	30

Note: The estimation method is two-step System-GMM with Windmeijer (2005) small sample robust correction. Time effects are included in all the regressions. *T*-statistics are below the coefficients. Instability is the five-year standard deviation of the growth rate of the corresponding variable. Data are averaged over six nonoverlapping five-year periods between 1975 and 2004. The dependent variable is consumption instability. *** p<0.01,** p<0.05,* p<0.1.

Table 2.7: Threshold effects in the relationship between remittances and consumption instability: Nonlinear System-GMM method

Remittances (% GDP)	-1.067**
	(2.31)
Remittances × $d_R = \mathbf{1}[R \geq 5.5\ \%]$	0.824**
	(2.06)
Private credit ratio (% GDP)	-0.049**
	(2.43)
GDP per capita instability	0.485***
	(2.90)
lag dependent variable	0.134
	(0.94)
Initial GDP per capita	-0.938*
	(1.67)
Trade openness	0.054**
	(2.44)
Government consumption (% GDP)	0.336
	(1.27)
Financial openness	3.045
	(1.44)
(Financial openness)^2	-0.564
	(1.31)
Constant	2.871
	(0.62)
Observations	265
Countries	77
Joint significance of remittances (p-value)	0.027
Threshold of remittances ratio	5.5%
Countries above the threshold	13
Percentage of countries above the threshold	17
AR(1):p-value	0.052
AR(2):p-value	0.511
Hansen p-value	0.300
Instruments	26

Note: The estimation method is two-step System-GMM with Windmeijer (2005) small sample robust correction. Time effects are included in all the regressions. *T*-statistics are below the coefficients. Instability is the five-year standard deviation of the growth rate of the corresponding variable. Data are averaged over six nonoverlapping five-year periods between 1975 and 2004. The dependent variable is consumption instability. *** p<0.01,** p<0.05,* p<0.1.

Table 2.8: Remittances and consumption instability: Alternative measures of financial development

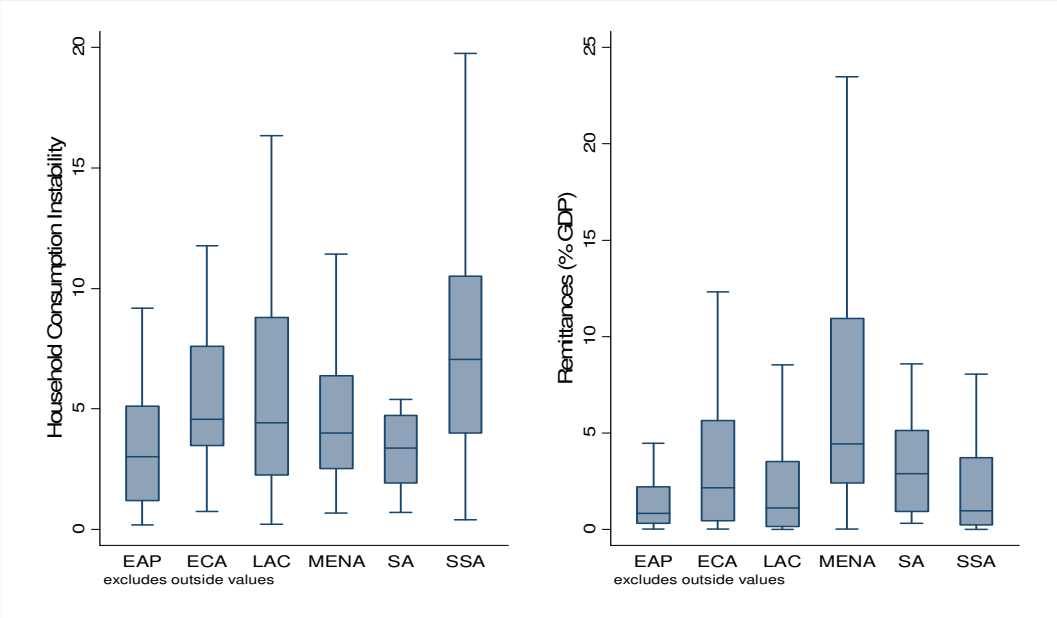
	(1)	(2)
Remittances (% GDP)	-0.676**	-0.407**
	(2.04)	(2.50)
Remittances × Bank deposits ratio	0.010*	
	(1.84)	
Bank deposits ratio (% GDP)	-0.068**	
	(2.19)	
Remittances × M2 ratio		0.005**
		(2.02)
M2 (% GDP)		-0.045**
		(2.09)
GDP per capita instability	0.573***	0.663***
	(3.56)	(3.53)
lag dependent variable	0.128	0.133
	(1.01)	(1.01)
Initial GDP per capita	-1.181***	-1.176***
	(2.69)	(3.81)
Trade openness	0.074**	0.067***
	(2.47)	(3.28)
Government consumption (% GDP)	0.242	0.234
	(1.04)	(1.41)
Financial openness	3.612*	3.266*
	(1.76)	(1.74)
(Financial openness) ²	-0.681	-0.621
	(1.64)	(1.66)
Constant	3.567	3.579
	(0.87)	(0.99)
Observations	265	294
Countries	77	87
Joint significance of remittances (p-value)	0.119	0.044
Turning point of financial development	65.13	81.68
Number of countries above the threshold	2	4
AR(1):p-value	0.066	0.055
AR(2):p-value	0.911	0.590
Hansen p-value	0.458	0.600
Instruments	27	27

Note: The estimation method is two-step System-GMM with Windmeijer (2005) small sample robust correction. Time effects are included in all the regressions. *T*-statistics are below the coefficients. Instability is the five-year standard deviation of the growth rate of the corresponding variable. Data are averaged over six nonoverlapping five-year periods between 1975 and 2004. The dependent variable is consumption instability. *** p<0.01,** p<0.05,* p<0.1.

Table 2.9: Remittances and consumption instability: Alternative measures of remittances

	real remittances per capita (log)			Remittances *net* of compensations (% GDP)		
	(1)	(2)	(3)	(4)	(5)	(6)
Remittances	-1.125**	-1.297**	2.781***	-0.713**	-0.540**	0.617**
	(2.35)	(2.10)	(2.72)	(2.49)	(2.07)	(2.46)
Remittances × Private credit ratio		0.035**			0.013**	
		(2.50)			(2.37)	
Remittances × GDP per capita instability			-0.426**			-0.105**
			(2.30)			(2.26)
Private credit ratio (% GDP)	-0.005	-0.082**	-0.039	-0.005	-0.063*	-0.072
	(0.17)	(2.30)	(0.72)	(0.21)	(1.86)	(0.92)
GDP per capita instability	0.534***	0.540***	1.257***	0.559***	0.605***	0.661**
	(4.08)	(3.65)	(2.98)	(4.62)	(3.60)	(2.44)
lag dependent variable	0.087	0.070	0.339**	0.254*	0.126	0.346
	(0.53)	(0.36)	(2.18)	(1.78)	(0.82)	(1.23)
Initial GDP per capita	0.474	0.303	-0.243	-0.745*	-0.473	2.015
	(1.12)	(0.77)	(0.11)	(1.92)	(1.22)	(0.58)
Trade openness	0.015	0.039	0.054	0.036	0.049*	0.031
	(0.68)	(1.60)	(1.64)	(1.61)	(1.67)	(0.93)
Government consumption (% GDP)	-0.051	-0.222	0.038	0.124	0.095	0.041
	(0.29)	(0.93)	(0.13)	(0.78)	(0.51)	(0.12)
Financial openness	-0.029	-0.388	1.405	1.425	4.335**	0.637
	(0.02)	(0.21)	(0.75)	(0.76)	(2.14)	(0.42)
(Financial openness) ²	-0.033	-0.060	-0.522	-0.130	-0.889**	-0.300
	(0.10)	(0.15)	(1.31)	(0.33)	(2.11)	(0.79)
Constant	2.736	5.719	-6.309	3.559	1.189	-13.438
	(0.92)	(1.07)	(0.50)	(1.13)	(0.27)	(0.53)
Observations	256	256	256	273	273	273
Countries	75	75	75	76	76	76
Joint significance of remittances (p-value)	..	0.044	0.029	..	0.066	0.049
AR(1): p-value	0.101	0.252	0.034	0.009	0.085	0.093
AR(2): p-value	0.440	0.200	0.416	0.159	0.200	0.273
Hansen p-value	0.758	0.691	0.773	0.519	0.556	0.417
Instruments	20	22	28	22	24	26

Note: The estimation method is two-step System-GMM with Windmeijer (2005) small sample robust correction. Time effects are included in all the regressions. *T*-statistics are below the coefficients. *** p<0.01,** p<0.05,* p<0.1.



Note: In box plots, the lower and upper hinges of each box show the 25th and 75th percentiles of the samples, the line in the box indicates the respective medians, and the end-points of whiskers mark next adjacent values. EAP: East Asia and Pacific, ECA: Europe and Central Asia, LAC: Latin America and Caribbean, MENA: Middle East and North Africa, SA: South Asia, SSA: Sub-Saharan Africa.
Source: World Bank, World Development Indicators (2009).

Figure 2.1. Consumption instability and remittances in developing regions, 1975–2004.

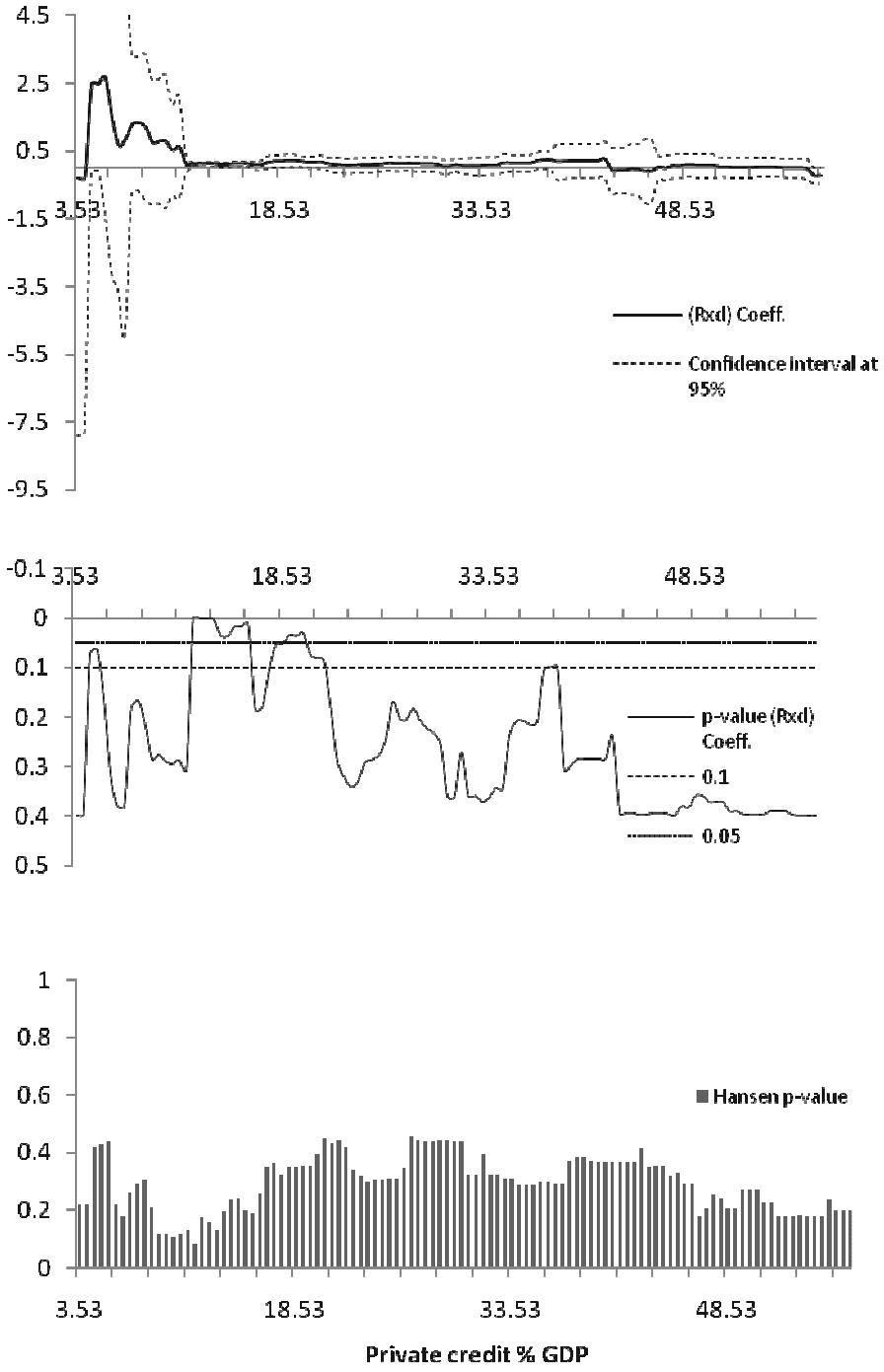


Figure 2.2. Evolution of the coefficient associated with the interactive term of remittances crossed with the private credit ratio: Nonlinear System-GMM Estimation

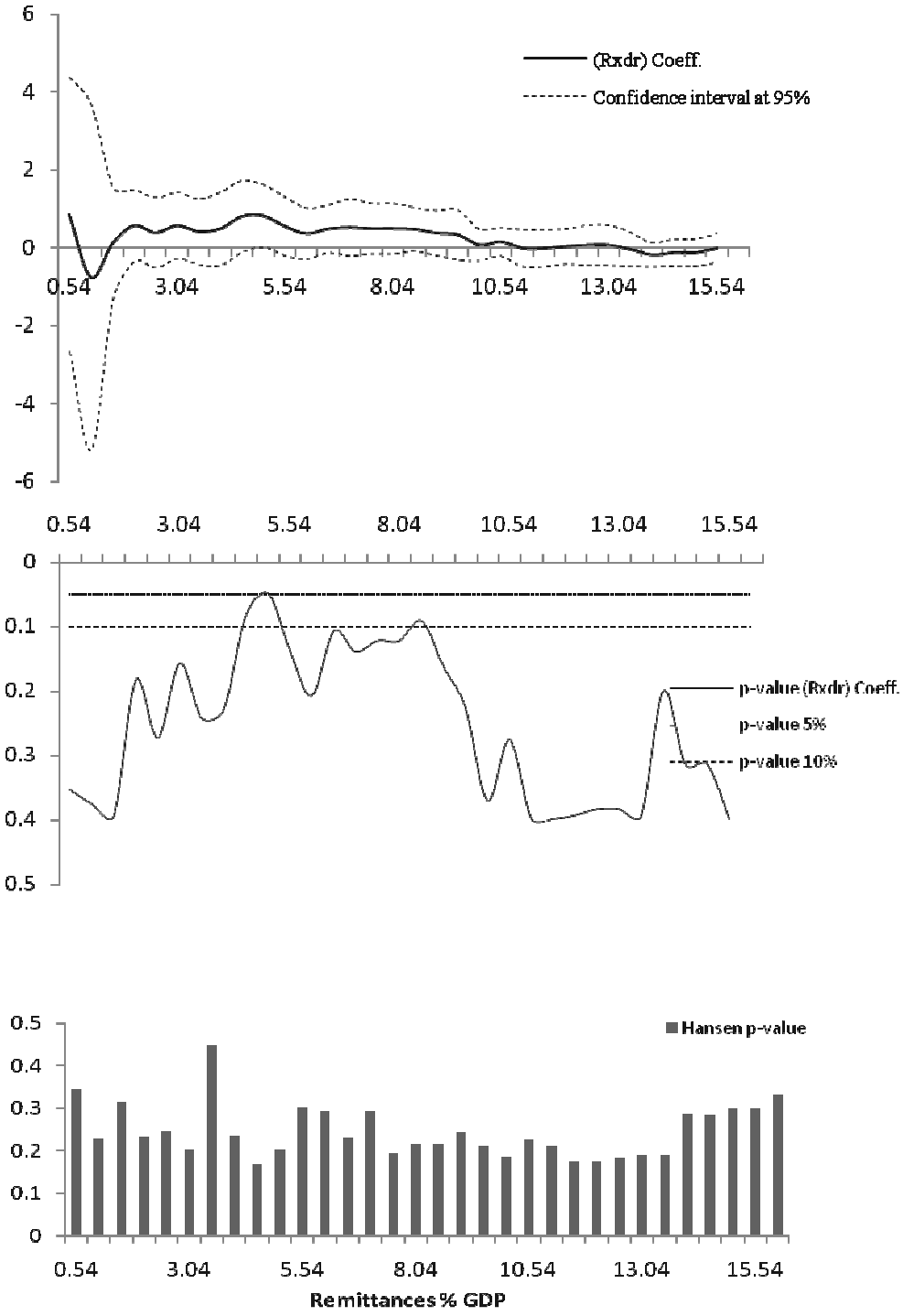


Figure 2.3: Evolution of the coefficient associated with the nonlinear term in remittances: Nonlinear System GMM Estimation

Appendix B. Data definitions and sources of variables

Consumption instability: Standard deviation of the real household consumption per capita growth rate estimated over a nonoverlapping five-year period. Household consumption per capita was drawn from World Bank tables, World Development Indicators (2009).

Gross domestic product per capita: Logarithm of the GDP per capita. Data are in constant 2000 U.S. dollars (World Development Indicators, 2009).

Trade openness: Sum of exports and imports of goods and services measured as a share of gross domestic product (World Development Indicators, 2009).

Remittances: Ratio of workers' remittances and compensation of employees to GDP. Workers' remittances and compensation of employees comprised current transfers by migrant workers and wages and salaries earned by nonresident workers. Workers' remittances were classified as current private transfers from migrant workers who were residents of the host country to recipients in their country of origin. They included only transfers made by workers who have been living in the host country for more than a year, irrespective of their immigration status. Compensation of employees is the income of migrants who had lived in the host country for less than a year. Migrants' transfers were defined as the net worth of migrants that is transferred from one country to another at the time of migration for those who are expected to remain in the host country for more than one year. (World Development Indicators, 2009).

Private credit ratio: Private credit by deposit money banks to GDP ratio (Beck, T., Demirgüç-Kunt, A. and Levine, R., 2000, Financial institutions and markets across countries and over time: data and analysis, World Bank Policy Research Working Paper No. 4943, May 2009).

Bank deposits ratio: Deposits by deposit money banks to GDP ratio (Beck, T., Demirgüç-Kunt, A. and Levine, R., 2000, Financial institutions and markets across countries and over time: data and analysis, World Bank Policy Research Working Paper No. 4943, May 2009).

Financial openness: Defined as 2+KAOPEN, where KAOPEN is the Chinn-Ito Financial Openness Variable (Chinn and Ito, (2008), "A New Measure of Financial Openness"). This index takes on higher values for countries more open to cross-border capital transactions. KAOPEN utilizes four major categories of restrictions on external accounts: (1) the presence of multiple exchange rates; (2) restrictions on the current account transactions; (3) restrictions on the capital account transactions; (4) requirements for surrender of export proceeds.

Aid: Ratio of foreign aid to Gross National Income (GNI). Aid includes both official development assistance (ODA) and official aid. Ratios are computed using values in U.S. dollars (World Development Indicators, 2009).

Government consumption: Ratio of government consumption divided by the GDP (World Development Indicators, 2009).

Discretionary fiscal policy: Standard deviation of the residual component of the log difference of government consumption from an econometric model of the former over the log difference of GDP, with a time trend and inflation in a quadratic form (Fatas and Mihov, 2003). Current output growth was instrumented with two lags of GDP growth and lagged inflation. We included inflation to ensure that the results were not driven by high-inflation episodes in which the co-movement between real government spending and output might be due to monetary instability rather than fiscal policy. Inflation squared was included to control for a possible nonlinear relationship between inflation and spending. The model was estimated for each country separately.

GDP per capita growth instability: Standard deviation of GDP per capita growth rate estimated over nonoverlapping five-year periods (World Development Indicators, 2009).

Inflation instability: Standard deviation of the consumer price index growth rate estimated over nonoverlapping five-year periods (World Development Indicators, 2009).

NEER instability: Standard deviation of the nominal effective exchange rate index growth rate estimated over nonoverlapping five-year periods (World Development Indicators, 2009).

Natural disasters: The reported measure of the total number of people affected by natural disasters. The number of people affected is divided by the total population in the year prior to the disaster year (Center for Research on the Epidemiology of Disasters (CRED), Emergency Events Database (EM-DAT)).

Agricultural instability: Standard deviation of the agricultural value added growth rate estimated over nonoverlapping five-year periods (World Development Indicators, 2009).

Financial and systemic banking crisis: Two conditions needed to be met for a banking crisis to be considered systemic: (1) significant signs of financial distress in the banking system (as indicated by significant bank runs, losses in the banking system, and bank liquidations); and (2) significant banking policy intervention measures in response to significant losses in the banking system (liquidity support, bank restructuring, bank nationalizations, guarantees on liabilities, asset purchases, deposit freezes and bank holidays) (Laeven and Valencia, 2010).

Financial and systemic banking crisis, Output losses: Computed as the cumulative sum of the differences between actual and trend real GDP over the period [T, T+3], expressed as a percentage of trend real GDP, where T the starting year of the crisis. Trend real GDP is computing by applying an HP filter (with λ=100) to the log of real GDP series over [T-20, T-1] (Laeven and Valencia, 2010).

Chapter 3. Do remittances dampen the effects of natural disasters on output volatility?

3.1. Introduction

The question of the costs of natural disasters becomes crucial following the fear about the consequences of the global warming which could amplify the occurrence of extreme climatic events particularly in the tropical zones (IPCC Report, 2007). These climatic events combined with geophysical disasters are a major concern in developing countries due to their lower degree of resilience to shocks (Kahn, 2005; Noy, 2009; Cuaresma, 2010). For instance, Naude (2010) using the CRED statistics, shows that Sub-Saharan Africa and South Asia recorded between 1974 and 2003, the largest number of people affected by natural disasters. Natural disasters are shown to permanently and negatively affecting growth in developing countries through lower investments in education (Cuaresma, 2010) and by pushing households into poverty trap (Carter *et al.*, 2007).

According to some recent evidences (Haiti) and existing papers, natural disasters tend to significantly increase remittances, whereas foreign aid seems less sensitive to disaster shocks (Yang, 2008b; Mohapatra *et al.*, 2009; David, 2010). Whether the altruistic response of migrants in the aftermath of natural disasters is generally observed, little is known about the effectiveness of remittances in the macroeconomic stabilization in this context. It's worth noting that the increase in remittances after a disaster does not always imply a stabilizing impact. Indeed, remittances will be stabilizing if they react immediately to the shock. Moreover, the size of remittance inflows matters: excessive remittances could generate inflation and real exchange appreciation in a context of destroyed productive capacities. The dependence on remittances can also lead to the well-known problem of 'Samaritan

dilemma'[44]: they might reduce the private demand for insurance and thereby they increase the costs of natural disasters.

This paper is the first cross-country study, to our knowledge, quantifying the stabilizing role played by remittances in developing countries facing natural disasters. While previous studies in the literature have highlighted the role of some factors shaping the macroeconomic effects of disasters,[45] it is surprising to see that remittances are omitted in the debate regarding the strategies available to cope with natural disaster shocks. Rather than focusing on the effects of natural disasters on economic growth, this paper examines their consequences on the volatility of economic growth. It therefore tests two hypotheses: (i) remittances on average dampen the destabilizing effect of natural disasters and (ii) beyond a given threshold the stabilizing role of remittances disappears.

Two mechanisms through which the stabilizing effect of remittances holds can be pointed-out: by providing a form of private insurance (ex post risk management strategy) and/or by promoting ex ante risk preparedness (ex ante risk management strategy). For the later case, several channels can be raised (Mohapatra *et al.*, 2009). Remittances can favor the diversification of activities. They can affect the choice of the localization of the productive activities toward less prone disaster areas. They can also help finance the acquisition of new technologies more resistant to natural shocks (seeds, housing built of concrete …). Remittances could not only reduce the magnitude of natural disasters but also, for a given number of people affected, they lower the resulting output volatility.

[44] The literature on the 'Samaritan dilemma' in the context of natural disasters includes among others, Raschky and Weck-Hannemann (2007); Cavallo and Noy (2009) and Kunreuther and Pauly (2009).
[45] See Noy (2009) on the discussion of the role of education, financial development, fiscal and trade policies, financial openness, and foreign reserves; Raschky (2008) for the role of domestic political institutions and Ramcharan (2007) for a discussion on the role of the exchange rate regime.

However, these stabilizing effects could be mitigated by the inflation generated by large remittance inflows and by the moral hazard effect that large remittance inflows can exert on recipient households ('Samaritan dilemma').

These hypotheses are tested on a large sample of developing countries (113) observed over the period 1980-2007 and by using dynamic panel data estimators. The results highlight a positive and significant impact of natural disasters on output growth volatility. It appears that remittances dampen the marginal destabilizing effect of natural disasters. This effect is maximized for remittance ratios belonging to the interval 8% - 17 % of GDP. However, above this high threshold, remittance inflows reinforce the positive impact of disasters on macroeconomic instability.

The remainder of the chapter is the following. Section 2 presents the econometric models, the data, the method and discusses the preliminary results. Section 3 checks the robustness of these results. Section 4 concludes.

3.2. Econometric Specifications and Preliminary Results

3.2.1. Models

The following models are specified to test the impact of natural disasters conditional on the level of remittance inflows.

The first model describes the impact of natural disasters on output growth volatility.

$$\sigma_{i,\tau} = \rho\sigma_{i,\tau-1} + X'_{i,\tau}\beta + \theta_1 D_{i,\tau} + u_i + \eta_\tau + \varepsilon_{i,\tau} \qquad (1)$$

where $\sigma_{i,\tau}$ is the output per capita growth volatility, X the matrix of control variables and D the indicator of the magnitude of natural disasters occurred in each country. u_i represents the country fixed-effects and η_τ the period dummies. i, τ are respectively the country and the non-overlapping 5-year sub-period over 1980-2007.[46] $\varepsilon_{i,\tau}$ is the idiosyncratic error term. The hypothesis tested is that $\theta_1 > 0$.

The second model reports the stabilizing contribution of remittances on output. We follow the standard specifications by including remittances linearly (Bugamelli and Paternò, 2011; Chami *et al.*, 2009):

$$\sigma_{i,\tau} = \rho\sigma_{i,\tau-1} + X'_{i,\tau}\beta + \theta_2 R_{i,\tau} + u_i + \eta_\tau + \varepsilon_{i,\tau} \qquad (2)$$

where *R* represents the remittance- to-GDP ratio. The hypothesis tested is that $\theta_2 < 0$.

The third model reports again the stabilizing contribution of remittances but controlling for the disaster variable.

$$\sigma_{i,\tau} = \rho\sigma_{i,\tau-1} + X'_{i,\tau}\beta + \theta_3 D_{i,\tau} + \theta_4 R_{i,\tau} + u_i + \eta_\tau + \varepsilon_{i,\tau} \quad (3)$$

The expected signs are $\theta_3 > 0$ and $\theta_4 < 0$. If remittances reduced the magnitude of the natural disasters, one would observe a decrease in absolute term, of the coefficient of remittances. More precisely, one would have: $|\theta_4| < |\theta_2|$. Indeed, θ_2 captures the total stabilizing effect of remittances (their direct and indirect impacts on output growth volatility).

[46] The last sub-period is however defined over 3 years rather than 5 due to the lack of available data in the Penn World 6.3 dataset.

When the disaster variable is introduced besides remittances, the residual impact of remittances (θ_4) now measures only the direct effect that does not pass through the reduction of the magnitude of disasters. Furthermore we expect $\theta_3 > \theta_1$. This happens because remittances can generate countercyclical remittance inflows (Yang, 2008b; Mohapatra *et al.*, 2009; David, 2010). Controlling for remittances ensures that the impact of natural disasters does not include a stabilizing component due to a surge of countercyclical remittance inflows. Finally the fourth model catches the interaction between remittances and natural disasters.

$$\sigma_{i,\tau} = \rho\sigma_{i,\tau-1} + X'_{i,\tau}\beta + \theta_5 D_{i,\tau} + \theta_6 R_{i,\tau} + \theta_7 D_{i,\tau} * R_{i,\tau} + u_i + \eta_\tau + \varepsilon_{i,\tau} \quad (4)$$

The main hypothesis tested is that the impact of natural disasters on output per capita growth volatility is less positive as the level of remittances increases. More precisely, we expect that $\theta_5 > 0$ and $\theta_7 < 0$. No specific claim regarding the sign of θ_6, the impact of remittances without natural disasters, is formulated.

Given that θ_5 and θ_7 have opposite signs, a threshold level of remittances arises:

$$\frac{\partial \sigma_{i,\tau}}{\partial D_{i,\tau}} = \theta_5 + \theta_7 R_{i,\tau} = 0 \Rightarrow R^* = -\frac{\theta_5}{\theta_7}$$

R^* measures the minimum remittance ratio required for a full absorption of the effect of natural disasters.

The lagged output per capita growth volatility is included to capture the inertia in the dependent variable (Yang, 2008a). The matrix of standard control variables includes the following variables. Trade openness would have a positive effect on output growth volatility given that trade openness can enhance sectorial specialization what increases the degree of

exposure to external shocks (Di Giovanni and Levchenko, 2009). Terms of trade volatility is also a potential candidate for enhancing macroeconomic instability. The government size may positively contribute to macroeconomic instability in developing countries (Bekaert *et al.* 2006). Finally, as shown by Fatas and Mihov (2003), the discretionary fiscal policy is assumed to fuel output growth volatility. The term discretionary fiscal policy refers to changes in fiscal policy that do not represent reaction to economic conditions.

3.2.2. Data and sample

Following existing studies (Chami *et al.*, 2008; Bugamelli and Paternò, 2011, Chami *et al.*, 2009), the dependent variable is computed as the standard deviation of the GDP per capita growth rate over each sub-period. GDP per capita growth rate is drawn from the Penn World Tables 6.3. The remaining variables are computed as 5-year averages over each sub-period.

Natural disaster data are drawn from Center for Research on the Epidemiology of Disasters (CRED), Emergency Events Database (EM-DAT).[47] CRED defines a disaster as a natural situation or event which overwhelms local capacity, implying a request for external assistance (Noy, 2009; EM-DAT Glossary of terms).[48] We consider all disaster events taken together within a country in a year rather than each of them examined separately. Indeed, it's difficult to assume that the stabilizing role of remittances differs among types of disasters: what matters for the migrant is the magnitude of the disaster and not its type. The total number of people affected over the sub-period over the population at each of the beginning sub-period is

[47] The Center for Research on the Epidemiology of Disasters (CRED) has collected and made publically available data on the occurrence and effects of natural disasters from 1900 to the present with a worldwide coverage. The database is compiled from various sources, including UN agencies, non-governmental organizations, insurance companies, research institutions and press agencies. The EM-DAT data is publicly available on CRED's web site at: www.cred.be.

[48] These disasters can be grouped into several categories, of which meteorological disasters (floods, wave surges, storms, droughts, landslides and avalanches), climatological disasters (disasters caused due to long run or seasonal climatic variability such as drought, extreme temperatures and wild fire) and geophysical disasters (earthquakes, tsunamis and volcanic eruptions).

used as a magnitude indicator.[49] Two main arguments justify the choice for this variable (Loayza *et al.*, 2009). Firstly, the measurement error associated with the proportion of people affected seems lower than that associated with a variable reporting the damage costs in US dollars. Secondly, the endogeneity concerns are more plausible with the damage costs which are closely related to macroeconomic instability and growth.[50]

The remittance variable records current transfers to nonresidents by migrants who are employed in, and considered a resident of, the countries that host them. The variable is normalized by country initial GDP.[51] Data are drawn from the IMF Balance of Payments Yearbook (various editions).

Trade openness and government size are the ratios of exports and imports and government consumption to GDP, respectively (Penn World Table 6.3). The volatility of the terms of trade is the standard deviation of the terms of trade growth rate (World Economic Outlook, IMF). Discretionary fiscal policy is measured as the standard deviation of the residual component of the log difference of government consumption from an econometric model of the former over the log difference of GDP, a time trend and inflation in a quadratic form (Fatas and Mihov, 2003). [52]

[49] The sum of people affected and killed is also used as an indicator of the natural disaster magnitude and results remain the same. Tables are available upon request.

[50] Output growth volatility can decrease the factors accumulation and therefore the mean growth rate (Ramey and Ramey, 1995). Hence, the damage costs which are proportional to the level of accumulation would be lower in countries with high macroeconomic volatility.

[51] Dividing remittances by the level of GDP at each of the beginning of 5-year sub-period allows neutralizing the effects of natural disasters on the denominator.

[52] We instrument for current output growth with two lags of GDP growth and lagged inflation. We include inflation to ensure that our results are not driven by high inflation episodes in which the co-movement between real government spending and output might be due to monetary instability rather than fiscal policy. Inflation squared is included to control for a possible nonlinear relationship between inflation and spending. The model is estimated for each country separately.

The sample comprises at most 113 developing countries and is unbalanced (for a maximum of observations stood at 403). The list of countries and descriptive statistics of all the variables used are presented in appendix.

Figure 3.1 shows the distribution of unweighted regional averages of natural disasters (percentage of people affected), remittance ratio and the output growth volatility. It appears that the three regions mostly affected by natural disasters are East Asia and Pacific (EAP), South Asia (SA) and Sub-Saharan Africa (SSA). In terms of remittance inflows, the top three recipients are Europe and Central Asia (ECA), the Middle East and North Africa region (MENA), and EAP. Finally in terms of output growth volatility, MENA, SSA, and ECA regions exhibit the highest levels of volatility over the entire period 1980-2007.

Figure 3.2 presents preliminary elements suggesting the existence of a non-linear impact of natural disasters on output growth volatility conditional on the level of remittances. The sample is divided into two sub-samples around the median value of remittances (2% over the period). Two scatter plots are computed with the magnitude of natural disasters on the x-axis and the output growth volatility on the y-axis.[53] Only the left hand panel (low level of remittances) shows a positive relationship between output growth volatility and natural disasters. This result justifies the econometric estimations aimed at testing the existence of a non-linear impact of disasters.

3.2.3. Estimation method

If remittances increase when the recipient economy experiences a strong output growth volatility, estimation of the remittance impact by the Ordinary Least Squares estimator (OLS)

[53] Output growth volatility and natural disasters are residuals derived from pooled regressions using five-year averages of these variables regressed on the same set of control variables (government consumption, trade openness, terms of trade shocks, discretionary fiscal policy). This gives adjusted measures of output growth volatility and natural disasters that are purged from any collinearity with standard output growth volatility determinants.

is biased. Moreover, the OLS estimator is inconsistent since the lagged dependent variable is introduced besides country fixed-effects. The System-GMM estimator must be implemented. The equations in levels and the equations in first differences are combined in a system and estimated with an extended System-GMM estimator which allows for the use of lagged differences and lagged levels of the explanatory variables as instruments (Blundell and Bond, 1998).[54] The GMM estimations control for the endogeneity of the remittances and other explanatory variables.[55]

Two specification tests check the validity of the instruments. The first is the standard Sargan/Hansen test of over-identifying restrictions. The second test examines the hypothesis that there is no second-order serial correlation in the first-differenced residuals. The diagnostic tests do not invalidate the quality of the instrumentation with the System-GMM framework.[56]

3.2.4. Preliminary results

Table 3.1 reports the results of the estimations of equations 1-4. The first column highlights a positive and significant impact of natural disasters on the output growth volatility. The dynamic specification is not rejected given the significant effect of the lagged output growth volatility. It also appears that terms of trade volatility, government consumption and the discretionary fiscal policy determine as expected, positively and significantly output growth volatility. Column 2 reveals a stabilizing effect of remittances on output. In column 3, both remittances and natural disasters are introduced. As expected, it appears that the destabilizing

[54] The paper uses the System-GMM estimator developed by Blundell and Bond (1998) for dynamic panel data with the Windmeijer (2005) correction for finite sample bias.

[55] In all specifications, period dummies, terms of trade volatility, discretionary fiscal policy, trade openness and natural disasters are taken as strictly exogenous. Government size and the lagged dependent variable are predetermined while remittances and remittances crossed with natural disasters are taken as endogenous.

[56] To deal with the well-known problem of instrument proliferation raised by the system-GMM estimator (Roodman, 2009), the matrix of instruments is collapsed and the number of lags is limited at 3.

effect of natural disasters increases slightly while the stabilizing effect of remittances is slightly lower.[57]

In column 4, the interaction of natural disasters and remittances is included. As expected, its sign is negative and significant while the coefficient of natural disasters introduced additively remains positive and significant.[58] However, the remittance coefficient is no longer significant when the model allows the interaction term. This can be explained by the fact the coefficient identifies the impact of remittances without natural disasters. In this situation the stabilizing impact appears less effective.

The table shows the remittance level required for a full absorption of disaster shocks. It stands at 6% of GDP on average. This concerns 26% of countries over the entire period.

3.3. Robustness Checks

The robustness of the previous results is tested in three ways. Firstly, more control variables are added to the models. Secondly, alternative measures of disasters are used and thirdly, the threshold level of remittances that fully absorbs the impact of disasters is endogenously determined by a non-linear recursive System-GMM method.

3.3.1. Adding more control variables

Several control variables are added to the analysis to reduce the omitted variable bias. The initial level of population (drawn from the World Bank Tables) is introduced because small countries are those that receive more remittance over GDP and are those with a weak ability of risk sharing. Financial openness is also introduced to ensure that the stabilizing effect of

[57] It also emerges that trade openness variable has a positive and significant impact in this specification.
[58] Table 3.1 also shows the joint significant test probability associated with the natural disaster coefficients. The null hypothesis that they are not significant is rejected.

remittances doesn't reflect the adjustment through financial openness.[59] Two indicators of financial openness are tested. The first one is the sum of assets and liabilities over GDP drawn from Lane and Milesi-Ferretti (2007) and the second one is the index computed by Chinn and Ito (2008).The initial level of development is included because poor countries are often those characterized by a high level of macroeconomic volatility, and by the same time are those which receive large inflows of remittances.

Financial development is included to ensure that the effect of remittances is not driven by the correlation between financial development and remittances. Indeed, there are now some evidences that remittances are positively correlated with the level of financial development in the receiving countries given that a high level of financial development decreases the transaction costs associated with the transfers of money (Freund and Spatafora, 2008). The level of financial development is defined as the ratio of deposit money banks credit to the private sector divided by country GDP (World Bank Tables).

Finally, foreign aid-to-GDP ratio is added to ensure that the results are not driven by the positive correlation between foreign aid and remittances in poor countries. Foreign aid data are drawn from the World Bank Tables.

Table 3.2 resumes the results obtained. It appears that whatever the control variables introduced, the non-linear effect of natural disasters conditional on the level of remittance inflows always holds. Moreover, the threshold level of remittances required for a full absorption of the disaster shocks stays around 6% in all the specifications. The results also indicate that the control variables introduced do not add something new to the analysis in the extent to which they are generally not statistically significant. This validates the choice of the basic determinants of output growth volatility retained early.

[59] Indeed, remittance inflows might be determined by financial openness through the reduction of transaction costs.

3.3.2. Alternative measures of disasters

Two alternative measures of the percentage of people affected are tested. The first measure allows giving more weights to the last observations inside each of the 5-year sub-periods. Giving more weights to last observations ensures that the impact of the disaster is not altered or attenuated by macroeconomic adjustments that follow the disaster events in each of the sub-periods. The results obtained by this exercise would be therefore interpreted as the upper bound estimates of the impact of natural disasters on output growth volatility. The following formula is used to weight the observations of disasters:

$$wD_{i,\tau} = 100 \times \sum_{t=1}^{5} \left(\frac{5+t}{10} \right) \times \frac{np_{i,t}}{pop_{i,1}}$$

where t is a time trend defined in each sub-period, np the number of people affected at each year and pop the population size.

The second measure that we use for natural disasters is the logarithmic transformation of the original values of disasters. Following Loayza *et al.*, (2009) the logarithmic transformation of the disaster variable helps dealing with the positively skewed distribution of the disaster measure as well as the bias due to extreme values. The following log transformation is applied to the data:

$$lD_{i,\tau} = \log \left(1 + \sum_{t=1}^{5} \frac{np_{i,t}}{pop_{i,1}} \right)$$

Table 3.3 reports the results obtained. The first three columns present the results obtained with the weighted measure of disasters. The positive and significant impact of natural disasters on output growth volatility still remains and appears much higher than that obtained in Table 3.1. In column 3.3, the result that remittance inflows dampen the effects of natural disasters on output growth volatility is confirmed again through the negative sign taken by the coefficient of the interactive term.

The last three columns of Table 3.3 describe the results obtained with the log transformation of natural disasters. Again, the same story holds. Natural disasters are positively and significantly associated with macroeconomic volatility (columns 3.4 and 3.5). In column 3.6, the coefficient of the interactive term remains negative and statistically significant.

3.3.3. Endogenous determination of the remittance threshold

An alternative model to test the non linearity is implemented with rolling estimations for different values taken by the ratio of remittances. A dummy variable d_R in interaction with the disaster variable is specified. d_R is equal to 1 if the country has a value of remittance ratio greater than $R*$ and 0 otherwise. This methodology for threshold determination in the case of endogenous regressors in a System-GMM framework has been previously implemented by Masten *et al.* (2008).[60] The following equation is specified:

$$\sigma_{i,\tau} = \rho\sigma_{i,\tau-1} + X'_{i,\tau}\beta + \theta_8 D_{i,\tau} + \theta_9 R_{i,\tau} + \theta_{10} D_{i,\tau} * d_R + u_i + \eta_\tau + \varepsilon_{i,\tau} \qquad (5)$$

$$\text{with } d_R = \mathbf{1}\left[R_{i,\tau} \geq R*\right]$$

[60] Another approach might consist in an estimation using the Hansen methodology and assuming that the threshold variable is exogenous. However, in our case the remittance ratio is not considered as strictly exogenous.

The top 5% and bottom 5% of the observations of the remittance ratio are dropped to ensure a feasible identification of the threshold. Remittance thresholds by increments of 0.5 percent are explored. Each equation corresponding to a different threshold is estimated by the System-GMM method. The optimal threshold is the one which maximizes the over identification Hansen test p-value. Testing nonlinear effect refers simply to the test of the null hypothesis that the coefficient on the interactive variable θ_{10} is equal to zero.

The optimal cutoff which maximizes the Hansen test p-value is a level of remittance ratio equal to 8% GDP. Only 18% of the countries are concerned by this threshold (compared to 26% in the previous results).

The corresponding estimation is shown in Table 3.4 column [4.1]. All the diagnostic tests associated with the System-GMM estimator validate the specification. The Table reports a significant and negative impact of the interactive term and a positive and significant effect of the additive term of natural disasters. This uncovers the existence of two regimes. The first regime characterized by low amount of remittance (under 8%) and a high level of marginal impact of natural disasters. The second regime is characterized by lower marginal impact of natural disasters.[61]

If we take two countries in the first regime (remittances less than 8% of GDP), one without experiencing a disaster and the second with the median value of natural disasters (2% of people affected), the predicted output growth volatility gap between the two countries is 0.32% (2*0.16) which represents 11% of the median value of the output growth volatility of the sample (2.90%). In the second regime, the same increase of natural disasters doesn't affect

[61] Indeed, the sum of the two coefficients associated with the disaster variable remains positive (0.163 - 0.159 = 0.004) and statistically equals to 0 (the corresponding p-value of the restriction stands at 0.88).

the output growth volatility given the zero marginal impact estimated. Therefore, remittances induce a stabilizing gain of 11% between the two regimes.

Another question that can be raised following these results concerns the permanent stabilizing impact of remittances above 8% of GDP.

Indeed, a recent strand of the literature highlights that remittances can fuel macroeconomic instability for high levels of the ratio (Chami *et al.*, 2009). The well-known 'transfer problem' is straightened when natural disaster shocks strongly destroy the productive capacity and at the same time, large remittance inflows increase domestic demand and then inflation and real exchange rate.

Knowing the previous threshold of remittances at 8%, the same estimation method is implemented to identify a second structural break above 8%. The following equation is estimated:

$$\sigma_{i,\tau} = \rho\sigma_{i,\tau-1} + X'_{i,\tau}\beta + \theta_{11}D_{i,\tau} + \theta_{12}R_{i,\tau} + \theta_{13}D_{i,\tau} * d^{L}{}_{R} + \theta_{14}D_{i,\tau} * d^{U}{}_{R} + u_i + \eta_\tau + \varepsilon_{i,\tau} \quad (6)$$

$$\text{with } d^{L}{}_{R} = \mathbf{1}\left[8\% \leq R_{i,\tau} < R*\right] \qquad \text{and } d^{U}{}_{R} = \mathbf{1}\left[R_{i,\tau} \geq R*\right]$$

Results are reported in column [4.2] in Table 3.4. θ_{11} identifies the marginal impact of natural disasters for remittance ratio below 8%. The estimated value stands at 0.187. $\theta_{11} + \theta_{13}$ measures the marginal impact of natural disasters when remittances are comprised between 8% and the new optimal threshold estimated at 17%. The value obtained of the impact is 0.187-0.185 = 0.02 and is not statistically different from zero. This result suggests that remittances are fully stabilizing for 14 countries inside this interval. But when the flows exceed 17%, the marginal destabilizing impact of disasters is enhanced ($\theta_{11} + \theta_{14} = 0.187 + 0.322 = 0.509$). This concerns only 6 countries in the sample.

3.4. Concluding remarks

This chapter showed the macroeconomic stabilizing effect of remittances in countries affected by natural disasters, in the majority of cases. However, large remittance inflows contributed to increase the output volatility induced by natural disasters, but for few numbers of countries (6 over 113).

The first policy implication is that emergency measures undertaken in the aftermath of natural disasters should restore the financial networks through which remittances transit when these networks have been disrupted. The second implication is that policymakers should be aware that very large remittance inflows could be a major macroeconomic problem which requires some adjustment policies even in the aftermath of natural disasters. For the medium term, policies aimed at promoting the investment of remittances into productive uses that are more resilient to shocks must be encouraged.

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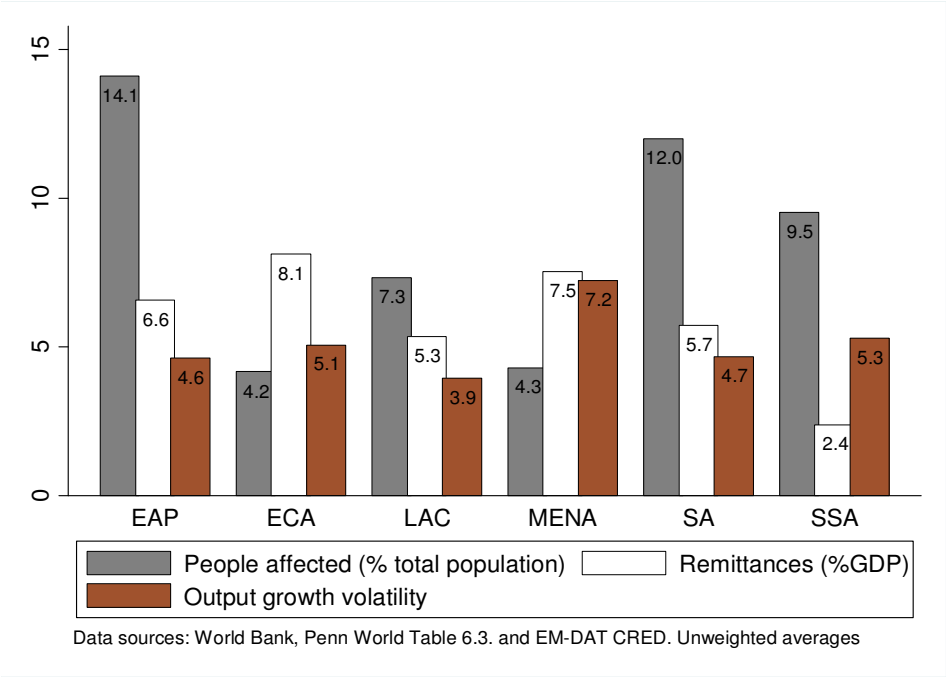
Figure 3.1. Distribution of natural disasters, remittances and output per capita growth volatility over regions (1980-2007).



Note: EAP: East Asia and Pacific, ECA: Europe and Central Asia, LAC: Latin America and Caribbean, MENA: Middle East and North Africa, SA: South Asia and SSA: Sub-Saharan Africa.

Figure 3.2. Output growth volatility and natural disasters

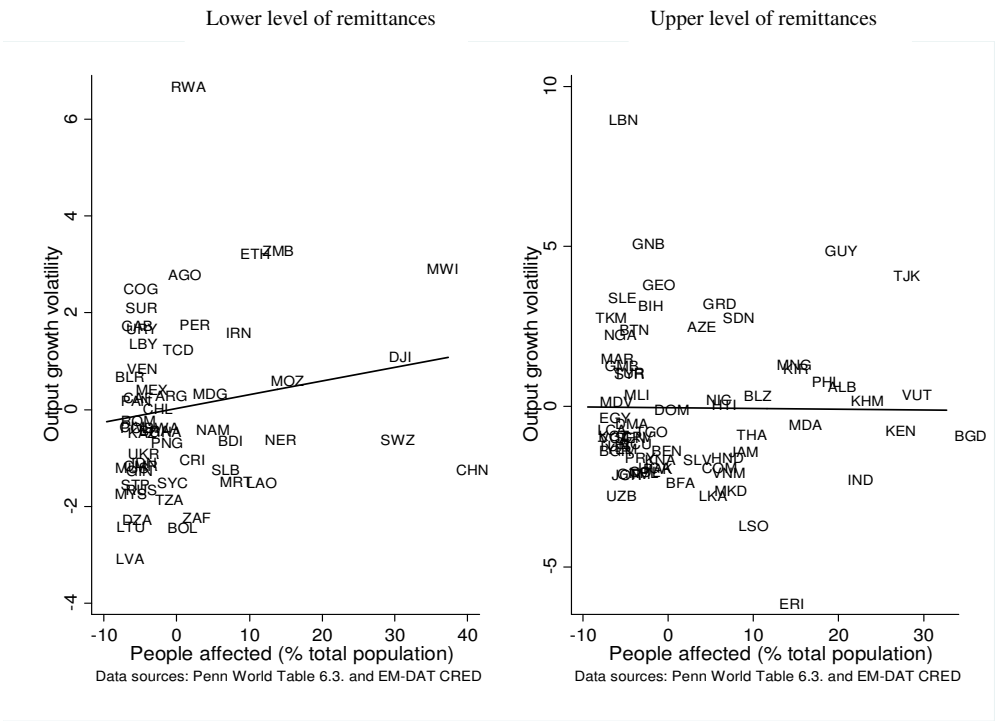


Table 3.1: Remittances, people affected and output growth volatility.

Period	1980-2007			
Unit of observation:	Non-overlapping 5-year averages			
	[1.1]	[1.2]	[1.3]	[1.4]
People affected (%)	0.013*		0.015*	0.065**
	1.79		1.91	2.21
People affected * Remittances				-0.011**
				1.97
Remittances (%GDP)		-0.167**	-0.144*	0.206
		2.05	1.73	1.26
Output growth volatility (t-1)	0.155**	0.156**	0.155**	0.084
	2.24	2.09	2.01	1.23
Trade openness	0.006	0.020	0.011**	0.001
	0.86	1.01	2.52	0.06
Terms of trade volatility	0.062***	0.069***	0.067***	0.065***
	3.94	5.32	5.87	4.03
Government consumption (%GDP)	0.203**	0.054**	0.061***	0.312***
	2.38	1.99	2.63	2.64
Discretionary fiscal policy	0.091**	0.084***	0.083**	0.086***
	2.04	2.59	2.39	2.65
Intercept	-2.836*	-0.090	0.191	-5.150**
	1.66	0.07	0.26	2.14
No observations	402	403	402	402
No countries	113	113	113	113
P-value of joint significance of disaster coefficients				0.084
Remittance threshold for full stabilization				6 %
Countries concerned				30
Percentage of countries				26 %
First order serial correlation p-value	0.001	0.001	0.001	0.005
Second order serial correlation p-value	0.063	0.185	0.192	0.211
Hansen OID test p-value	0.405	0.593	0.393	0.690
No instruments	20	17	17	25

Note: The estimation method is two-step System GMM with Windmeijer (2005) small sample robust correction. Time effects are included in all the regressions. *t*-statistics are below the coefficients. Volatility measures are the five-year standard deviation of the growth rate of the corresponding variables. **Dependent variable: Standard-deviation of output per capita growth rate**. *** p<0.01,** p<0.05,* p<0.1

Table 3.2. Natural disasters, remittances and output growth volatility: More controls

Period	1980-2007						
Unit of observation:	Non-overlapping 5-year averages						
	[2.1]	[2.2]	[2.3]	[2.4]	[2.5]	[2.6]	[2.7]
People affected (%)	0.063*	0.057*	0.063**	0.056**	0.072**	0.060**	0.072**
	1.93	1.94	2.15	2.10	1.96	2.17	2.05
People affected * Remittances	-0.011*	-0.011*	-0.011*	-0.009*	-0.012*	-0.010*	-0.012*
	1.77	1.75	1.93	1.80	1.66	1.79	1.73
Remittances (%GDP)	0.187	0.153	0.209	0.194	0.187	0.145	0.199
	0.99	0.85	1.33	1.19	1.01	1.05	1.05
Output growth volatility (t-1)	0.080	0.058	0.103	0.089	0.070	0.055	0.072
	1.14	0.91	1.47	1.32	0.92	0.74	0.98
Trade openness	0.012	-0.000	0.001	0.001	-0.001	-0.002	-0.000
	1.33	0.02	0.13	0.15	0.06	0.15	0.00
Terms of trade volatility	0.067***	0.075***	0.064***	0.062***	0.073***	0.070***	0.072***
	4.36	6.16	4.07	3.75	4.02	4.11	3.82
Government consumption (%GDP)	0.318***	0.240***	0.343***	0.328***	0.273**	0.246	0.267**
	2.59	2.76	2.76	2.88	2.30	1.57	2.29
Discretionary fiscal policy	0.089**	0.098***	0.088***	0.081**	0.107***	0.091***	0.105***
	2.51	3.03	2.72	2.39	2.76	2.96	2.69
Initial level of population (log)	0.353						
	1.52						
Financial development		0.022					
		1.59					
Financial openness (L and M-F)			-0.005			-0.002	
			1.49			0.46	
Financial openness (C and I)				-0.115			-0.139
				0.48			0.55
Foreign aid (% GDP)					-0.033	0.067	-0.033
					0.47	0.67	0.52
Initial GDP per capita (log)					0.807	1.456*	0.807
					1.23	1.76	1.23
Intercept	-11.567*	-4.308**	-5.381**	-5.242**	-10.390*	-15.479*	-10.213
	1.91	2.21	2.29	2.25	1.68	1.87	1.64
No observations	402	397	399	399	395	392	392
No countries	113	112	112	113	112	111	112
P-value of joint significance of disaster coefficients	0.153	0.147	0.096	0.098	0.113	0.082	0.086
Remittance threshold for full stabilization	6%	5%	6%	6%	6%	6%	6%
Countries concerned	31	33	31	28	30	28	30
Percentage of countries	27%	29%	28%	25%	28%	25%	27%
First order serial correlation p-value	0.007	0.006	0.008	0.006	0.004	0.010	0.004
Second order serial correlation p-value	0.210	0.203	0.217	0.223	0.212	0.174	0.222
Hansen OID test p-value	0.598	0.795	0.696	0.711	0.857	0.746	0.864
No instruments	27	29	27	27	27	31	28

Note: The estimation method is two-step system GMM with Windmeijer (2005) small sample robust correction. Time effects are included in all the regressions. *t*-statistics are below the coefficients. Volatility measures are the five-year standard deviation of the growth rate of the corresponding variables. **Dependent variable: Standard-deviation of output per capita growth rate**. *** p<0.01,** p<0.05,* p<0.1

Table 3.3. Alternative measures of disasters

Period	1980-2007					
Unit of observations:	Non-overlapping 5-year averages					
	[3.1]	[3.2]	[3.3]	[3.4]	[3.5]	[3.6]
People affected (%), *weighted*	0.023*	0.030*	0.085**			
	1.68	1.88	2.35			
People affected * Remittances			-0.028*			
			1.89			
log (1+People affected ratio)				1.728*	1.964*	7.198**
				1.68	1.77	2.13
log (1+ People affected)* Remittances						-1.169*
						1.73
Remittances (% GDP)		-0.138*	0.155		-0.145*	0.182
		1.67	1.58		1.74	1.52
Output growth volatility (*t*-1)	0.154**	0.153**	0.197**	0.157**	0.155**	0.121*
	2.48	1.98	2.29	2.29	2.01	1.81
Trade openness	-0.013	0.011**	-0.003	0.005	0.011**	-0.002
	0.66	2.55	0.27	0.80	2.56	0.22
Terms of trade volatility	0.061***	0.065***	0.045***	0.061***	0.067***	0.057***
	3.13	5.71	2.79	3.95	5.91	3.25
Government consumption (% GDP)	0.171**	0.059***	0.276**	0.220***	0.061***	0.342**
	2.08	2.62	2.14	2.60	2.62	2.42
Discretionary fiscal policy	0.096**	0.082**	0.078**	0.091**	0.083**	0.088***
	2.25	2.38	2.28	2.01	2.39	2.88
Intercept	-1.150	0.253	-4.211*	-3.177*	0.175	-5.690**
	0.46	0.35	1.65	1.88	0.24	2.13
No observations	402	402	402	402	402	402
No countries	113	113	113	113	113	113
P-value of joint significance of disaster coefficients			0.055			0.089
Remittance threshold for full stabilization			3%			6%
Countries concerned			49			28
Percentage of countries			43%			25%
First order serial correlation p-value	0.001	0.001	0.002	0.001	0.001	0.004
Second order serial correlation p-value	0.064	0.198	0.226	0.064	0.191	0.218
Hansen OID test p-value	0.468	0.403	0.739	0.314	0.387	0.773
No instruments	25	17	23	19	17	24

Note: The estimation method is two-step system GMM with Windmeijer (2005) small sample robust correction. Time effects are included in all the regressions. *t*-statistics are below the coefficients. Volatility measures are the five-year standard deviation of the growth rate of the corresponding variables. **Dependent variable: Standard-deviation of output per capita growth rate**. *** p<0.01,** p<0.05,* p<0.1

Table 3.4: Threshold levels of remittances: Non-linear system-GMM analysis

Period	1980-2007	
Unit of observation:	Non-overlapping 5-year averages	
	[4.1]	[4.2]
People affected (%)	0.163**	0.187*
	2.51	1.83
People affected * d_R=**1**[R≥8%]	-0.159**	
	2.40	
People affected * d_R=**1**[8%≤R<17%]		-0.185*
		1.71
People affected * d_R=**1**[R≥17%]		0.322*
		1.68
Remittances (%GDP)	0.146	-0.487
	1.36	1.43
Output growth volatility (t-1)	0.197**	0.085
	2.12	0.92
Trade openness	-0.010	-0.000
	0.76	0.01
Terms of trade volatility	0.053***	0.047***
	3.97	2.89
Government consumption (%GDP)	0.348*	0.170
	1.81	0.85
Discretionary fiscal policy	0.103***	0.110***
	3.63	3.77
Intercept	-6.995*	-1.613
	1.77	0.41
No observations	402	402
No countries	113	113
P-value of joint significance of disaster coefficients	0.042	0.100
Countries concerned for *R*≥8%	20	
Countries concerned for *R*≥17%		6
First order serial correlation p-value	0.026	0.020
Second order serial correlation p-value	0.145	0.119
Hansen OID test p-value	0.933	0.639
No instruments	24	23

Note: The estimation method is two-step system GMM with Windmeijer (2005) small sample robust correction. Time effects are included in all the regressions. *t*-statistics are below the coefficients. Volatility measures are the five-year standard deviation of the growth rate of the corresponding variables. **Dependent variable: Standard-deviation of output per capita growth rate**. *** p<0.01,** p<0.05,* p<0.1

Appendix C: Descriptive statistics and list of countries in the sample

Table C1 : Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
GDP per capita growth volatility	765	4.99	4.87	0.15	41.44
People affected (% *initial* population)	698	8.76	18.12	0	159.14
log (1+ people affected/*initial* population)	698	0.07	0.14	0	0.95
Weighted measure of people affected (%)	698	3.62	9.53	0	110.71
Remittance-to-*initial* GDP ratio (%)	430	5.23	8.26	0	89.30
Trade openness	780	79.54	41.69	1.75	266.42
Terms of trade growth volatility	691	11.58	13.62	0	176.79
Government consumption-to-GDP ratio (%)	780	22.31	12.17	3.38	72.30
Discretionary fiscal policy	760	11.01	13.31	0.03	155.92
Aid-to-GDP ratio (%)	607	11.07	14.07	-0.20	86.72
log (*initial* real GDP per capita)	643	8.08	0.88	5.08	10.15
Assets and Liabilities-to-GDP ratio (%)	708	142.91	147.57	13.09	1908.76
Chinn-Ito index	714	1.64	1.30	0.17	4.50
log (initial level of population)	698	15.42	2.07	9.50	20.98
Financial development	701	28.47	24.67	0.95	191.83

Table C2 : List of countries in the sample (**113**)

Albania	Chile	Guinea	Macedonia	Paraguay	Syria
Algeria	China	Guinea-Bissau	Madagascar	Peru	Tajikistan
Angola	Colombia	Guyana	Malawi	Philippines	Tanzania
Argentina	Comoros	Haiti	Malaysia	Poland	Togo
Azerbaijan	Congo, Rep.	Honduras	Mali	Romania	Tunisia
Bangladesh	Costa Rica	India	Mauritania	Russia	Turkey
Belize	Cote d'Ivoire	Indonesia	Mauritius	Rwanda	Uganda
Benin	Djibouti	Iran	Mexico	Sao Tome and Principe	Ukraine
Bolivia	Dominica	Jamaica	Moldova	Senegal	Uruguay
Bosnia and Herz.	Dominican Rep.	Jordan	Mongolia	Seychelles	Vanuatu
Botswana	Ecuador	Kazakhstan	Morocco	Sierra Leone	Venezuela
Brazil	Egypt	Kenya	Mozambique	Solomon Islands	Yemen
Bulgaria	El Salvador	Kiribati	Namibia	South Africa	Zambia
Burkina Faso	Ethiopia	Kyrgyz	Nepal	Sri Lanka	
Burundi	Gabon	Lao PDR	Nicaragua	St. Kitts and Nevis	
Cambodia	Gambia	Latvia	Niger	St. Lucia	
Cameroon	Georgia	Lebanon	Nigeria	St. Vincent and the Grenadines	
Cape Verde	Ghana	Lesotho	Pakistan	Sudan	
Central African Rep.	Grenada	Libya	Panama	Suriname	
Chad	Guatemala	Lithuania	Papua New Guinea	Swaziland	

PART 2. REMITTANCES AND THE GOVERNMENT

Chapter 4. Remittances, openness and government size[62]

[62] A version of this chapter is forthcoming at *Louvain Economic Review*

4.1. Introduction

Several arguments are evoked to explain the positive impact of trade openness on government size. Firstly, external openness increases the risks of macroeconomic volatility in small open economies (Easterly et al., 2000; di Giovanni and Levchenko, 2009). Governments react to this by increasing the share of the public sector to insulate the economy against the external shocks (Rodrik, 1998). Secondly, external openness increases the government size through the 'voracity effect'. This effect happens when an increase in the commodity price that a country exports leads to a more than proportional increase in the government spending (Tornell and Lane, 1999). Collier and Gunning (1999) seek to explain this effect by two factors: firstly, asymmetrical effects on fiscal policy of errors of optimism and pessimisms in the case of specific shock do matter. Secondly, the free-riding behaviors observed among the different ministries for attracting the resources generated by the positive external shocks can play a role. Talvi and Vegh (2005) conclude that political pressures in open economies lower the efforts for tax revenue mobilization, increase the level of government spending and therefore, aggravate the fiscal deficit. Combes and Saadi-Sedik (2006) showed that the positive effect of trade openness on fiscal deficit is generally observed in the case of natural trade openness (openness only due to structural factors) rather than in the case of trade-oriented policies.

Dreher et al. (2008) using a broadly measure of economic globalization conclude that the economic globalization does not influence government expenditures in a notable way. On the one hand, integration to the world economy can induce a welfare-state retrenchment in order to put the budget on the sustainable path and to build credibility ('discipline effect'). On the other hand, this globalization-induced welfare state retrenchment is potentially mitigated by

citizens' preferences to be compensated for the risks of globalization ('compensation hypothesis ').

Although the analysis of the relationship between the globalization and fiscal policy has been extensively studied, it is worth noting that little is said about the potential effect of another dimension of economic globalization that takes a crucial importance nowadays. Migrant remittances (the money sent back at home by international migrants) generated by large migration waves represent a large and stable source of external development finance received by developing countries (Ratha, 2005). According to the World Bank, remittances have exceeded 300 billion of US dollars in 2008 and they represent today more than the double of foreign aid. While many studies have examined the macroeconomic effects of remittances on the macroeconomic volatility (Bugamelli and Paternò, 2011; Chami et al., 2009b), on growth (Pradhan et al., 2008; Giuliano and Ruiz-Arranz, 2009; Catrinescu et al., 2009; Chami et al., 2009a) and competitiveness (Amuedo-Dorantes and Pozo, 2004; Acosta et al., 2009), few studies have investigated their effects on fiscal policy. Some papers included analyses of the impacts of remittances on debt sustainability (Abdih et al., 2009) on fiscal revenue (Chami et al., 2008) and two papers focused on the effect of remittances on government spending. Kapur and Singer (2006) showed that remittance inflows tend to reduce government consumption in developing countries and pointed-out the validation of the substitution effect between the private insurance provided by remittances and the public insurance initially provided by government spending. Shabbaz et al. (2008) found the same result for the case of Pakistan.

This paper enters this new literature on the consequences of remittances on the public policy in the receiving economies. The hypothesis that remittances modify the relationship between openness to trade and government size is tested. Indeed, if remittances are relatively countercyclical (as it has been recently shown by Frankel, 2011) or stable over time, they can provide a form of private insurance against various types of external shocks and hence

increase the welfare-state retrenchment in developing countries. Government could therefore reduce their role of insurer of last resort when countries receive stabilizing remittance inflows.

The paper revisits the Rodrik's (1998) hypothesis that more open economies have large government size. The paper proposes a theoretical discussion and an econometric test to show the magnitude with which remittances modify the elasticity of government consumption with respect to trade openness.

The rest of the chapter is organized as follows. Section 2 presents a theoretical model of the relationship between external risk, remittances and government spending. It appears that the equilibrium solution with remittances is characterized by a relatively lower level of government spending compared to a situation without remittances. In section 3, the countercyclicality of remittance inflows is measured by computing panel-data coefficients of the cyclicality of remittances vis-à-vis the real GDP cycle. We use the local Gaussian weighted ordinarily least squares (hereafter LGWOLS) to compute time-varying coefficients of remittance cyclicality for each countries in the sample. The results highlight a surge in the remittance countercyclicality during the 1990s and a significant and robust effect of trade openness on the countercyclicality of remittances. In section 4, the empirical test of the contribution of remittance inflows on the marginal impact of trade openness on government spending is proposed. Using a large sample of developing countries, and after factoring in the endogeneity of openness and remittances, the results indicate a decreasing marginal contribution of trade openness to government spending as the level of remittance inflows increases. In section 5, the predicted coefficients of remittance cyclicality derived from the LGWOLS method are used to test the hypothesis that countercyclical remittances help decrease the impact of trade openness on government size. Section 6 concludes on policy implications.

4.2. A simple theoretical model of remittances, external risk and government size

The departure point for this theoretical analysis is Rodrik (1998). He showed how openness to trade increases the insurance role played by the governments through public spending. His model is amended here to include remittances.

4.2.1. The no-remittance case

We consider an economy which exports a fix quantity of good *x* and produces two other goods: a good supplied by the public sector and a similar good supplied by the private sector. The total labor endowment is normalized at 1 with λ the share of labor employed in the public sector and $1-\lambda$ the remaining share in the private sector. Denotes π the export price expressed in terms of quantity of imports. π is therefore the index of terms of trade and is a random variable with a mean π_m and a variance σ^2. The tradable good *x* is not consumed domestically and the foreign good is not produced at home. Hence, the trade balance is always at its equilibrium and the economy imports the quantity πx. These imports are the inputs for the private sector in the production of the 'private good'. The production function in the private sector is supposed linear in the labor and is written as follows:

$$f = \pi x(1-\lambda) \qquad (1)$$

The supply function in the public sector is given by $h(\lambda)$ with $h' > 0$ and $h'' < 0$. The Government determines the size of the public sector before the realization of π. Moreover, the goods produced by the public and the private sectors are substitute in the consumption[63]

[63] Indeed, households can arbitrate between the public and the private sector for the choice of services such as security, school, energy, health care facilities … (see Abdih et al., 2008).

and the Government's problem consists of the maximization of the utility of a representative agent:

$$\max_{\lambda} V(\lambda) \equiv E\left[u\left(h(\lambda)+\pi x(1-\lambda)\right)\right] \qquad (2)$$

with $u(\bullet)$, the utility function of the representative agent, $u'(\bullet)>0$ and $u''(\bullet)<0$.

Following a second-order Taylor's approximation of $V(\lambda)$ around π_m, we obtain the following expression:

$$V(\lambda) = u\left(h(\lambda)+\pi_m x(1-\lambda)\right)+\frac{1}{2}u''\left(h(\lambda)+\pi_m x(1-\lambda)\right)(1-\lambda)^2 x^2\sigma^2 \qquad (3)$$

It appears that the expected utility of the representative agent decreases with openness and the variance of terms of trade. The first order condition with respect to λ leads to:

$$\left[u'(\bullet)+\frac{1}{2}x^2\sigma^2(1-\lambda)^2 u'''(\bullet)\right]\left(h'(\lambda)-\pi_m x\right)-\sigma^2 x^2(1-\lambda)u''(\bullet)=0 \qquad (4)$$

When the agent is prudent $\left(u'''(\bullet)>0\right)$, the term in the brackets is always positive and given that $h'(\lambda)>0$, we conclude that the optimal size of the public sector rises with the risk associated with trade openness $x^2\sigma^2$. Indeed, if we consider two situations, one in which the external risk is null $\left(R=\sigma^2x^2=0\right)$ and the other case in which the external risk is strictly positive $\left(\sigma^2x^2>0\right)$, we get the following results:

Case 1: $R=0$ and $h'(\lambda_1)=\pi_m x$

Case 2: $R>0$ and $h'(\lambda_2)=\pi_m x+\dfrac{\sigma^2x^2(1-\lambda_2)u''(\bullet)}{u'(\bullet)+\frac{1}{2}\sigma^2x^2(1-\lambda_2)^2u'''(\bullet)}$

Knowing that $\frac{\sigma^2 x^2 (1-\lambda_2) u''(\bullet)}{u'(\bullet) + \frac{1}{2}\sigma^2 x^2 (1-\lambda_2)^2 u'''(\bullet)} < 0$ since $u''(\bullet) < 0$, we get the following equality:

$h'(\lambda_2) < h'(\lambda_1)$.

Given the concave nature of the function *h*, we can conclude that $\lambda_2 > \lambda_1$. In other terms, the size of the public sector is higher in the case of existing external risk than in the case without an external risk.

4.2.2. The remittance case

Suppose now that the representative agent can receive remittances from abroad $r(\pi)$ and that they move countercyclically. More precisely, suppose that remittance inflows are countercyclical vis-à-vis the terms of trade: $r'(\pi) < 0$ et $r''(\pi) > 0$.[64] The expected utility function is re-written as follows:

$$W(\lambda) \equiv E[u(h(\lambda) + \pi x(1-\lambda) + r(\pi))] \qquad (5)$$

Using a second order Taylor's approximation of $W(\lambda)$ around π_m, we obtain :

$$W(\lambda) = u(h(\lambda) + \pi_m x(1-\lambda) + r(\pi_m))$$

$$+ \frac{1}{2}\sigma^2 (x(1-\lambda) + r'(\pi_m))^2 u''(h(\lambda) + \pi_m x(1-\lambda) + r(\pi_m)) \qquad (6)$$

[64] Indeed, remittances are more likely to react to the consequences that the terms of trade can exert on the agent's income rather than to terms of trade shocks themselves. The idea that remittances react to terms of trade shocks is basically a simplification in the theoretical model which is coherent with the empirical analysis that will be performed in Section 3. More precisely, in section 3, coefficients of remittance cyclicality are derived from the LGWOLS method in which remittance cycle is regressed on real GDP cycle instrumented by the terms of trade shocks. This is therefore close to the assumption raised in this theoretical model.

When the expression (6) is compared with (3), it can be observed that remittances dampen the impact of the external risk on the agent's utility.[65] The first-order condition with respect to λ gives:

$$\left[u'(\bullet)+\frac{1}{2}\sigma^2\left(x(1-\lambda)+r'(\pi_m)\right)^2u'''(\bullet)\right]\left(h'(\lambda)-\pi_m x\right)-\sigma^2x\left(x(1-\lambda)+r'(\pi_m)\right)u''(\bullet)=0 \qquad (7)$$

From the equation (7), the optimal size of the public sector in the case of existing external risk $\left(\sigma^2x^2>0\right)$ and remittance inflows, is determined by the following equality:

Case 3 : $R>0$, $r>0$, and $h'(\lambda_3)=\pi_m x+\dfrac{\sigma^2x\left(x(1-\lambda_3)+r'(\pi_m)\right)u''(\bullet)}{u'(\bullet)+\frac{1}{2}\sigma^2\left(x(1-\lambda_3)+r'(\pi_m)\right)^2u'''(\bullet)}$

Knowing that $r'(\pi_m)<0$, we have : $h'(\lambda_3)>h'(\lambda_2)$.[66] What leads to $\lambda_3<\lambda_2$.

The following result holds: The size of the public sector is lower in a small open economy which receives countercyclical remittances compared to the zero-remittance case. The fiscal retrenchment due to remittances is measured as: $\lambda_3-\lambda_2<0$.

This prediction has important policy implications insofar as it enters the dilemma that characterizes developing countries: integrating the global economy to take advantage of the gain of the globalization, providing social safety nets and insuring against the vagaries of globalization and at the same time, reducing the size of the public sector through fiscal consolidations. This 'impossible trinity' (fiscal consolidation, macroeconomic insurance through government spending and globalization) is broken-down if we consider that households can receive remittance inflows from abroad. By providing a form of private

[65] Remember that $r'(\pi)<0$ et $r''(\pi)>0$

[66] This arises since $\dfrac{\sigma^2x\left(x(1-\lambda)+r'(\pi_m)\right)}{u'(\bullet)+\frac{1}{2}\sigma^2\left(x(1-\lambda)+r'(\pi_m)\right)^2u'''(\bullet)}<\dfrac{\sigma^2x^2(1-\lambda)}{u'(\bullet)+\frac{1}{2}\sigma^2x^2(1-\lambda)^2u'''(\bullet)}$.

insurance they can therefore reduce the role of insurer of last resort that the governments play in small open economies.

The next section tests empirically the countercyclicality of remittance inflows in a large sample of developing countries.

4.3. Time-varying measure of remittance cyclicality

This section is devoted to the measure of the time-varying cyclicality of remittances and to assess the impact of external openness on it. The hypothesis tested is that external openness is associated with more countercyclical remittances because the later compensates for the risks associated with the former.

4.3.1. The cyclicality of remittance in the literature

The empirical literature analyzing the cyclical properties of remittances consists of an evaluation of the cyclicality of remittances with respect to GDP cycle. The results are however mixed. For some authors, remittance inflows react countercyclically vis-à-vis the real GDP cycle (see Sayan, 2006 for the case of the low and lower middle income countries). Lueth and Ruiz-Arranz (2007) however concluded that remittances are procyclical with respect to the business cycle in Sri Lanka. Acosta et al. (2008) showed that the countercyclicality of remittances appears to increase with income, being highest among upper-middle income countries. This result is close to the one of Giuliano and Ruiz-Arranz (2009) who found that remittances were more procyclical in countries with shallower financial systems. Neagu and Schiff (2009) addressed the question of the cyclicality of remittances and found that remittances are pro-cyclical in 65% of cases in the period 1980-2007 on the basis of 116 developing countries. Finally, Gupta et al. (2009) showed that remittance de-trended inflows for Sub-Saharan Africa are positively correlated with GDP

growth during the period 1980-1995 but remittances appear countercyclical with respect to GDP growth during the last decade.

4.3.2. How to compute time-varying country-specific indicators of cyclicality?

All previous studies analyzing the cyclicality of remittances vis-à-vis the GDP have derived one single coefficient of the cyclicality of remittances for countries or for regions over the time. This constitutes a clear limitation insofar as the cyclicality of remittances is not necessary an invariant phenomenon. The cyclicality of remittances could vary for example in one country if the synchronicity of the business cycles of the receiving and the source countries varies over the time. The cyclicality may also be different among various stages of migration. Indeed, one could expect more countercyclical remittances at the beginning of the migration history and procyclical ones afterwards. This happens when remittances are primarily used for consumption purposes in the first stage and used for investment in the later stage.

Another difference between our study and the previous ones is that the coefficients of the cyclicality of remittances vis-à-vis the GDP are identified by resorting to an instrumental variable strategy. This is justified by the fact that remittance inflows could react to the business cycle in the receiving country but also, remittances could affect the economic activity (GDP growth) at home as it has been shown in the literature (Pradhan et al. 2008; Catrinescu et al., 2009; Giuliano and Ruiz-Arranz, 2009). This reverse causality could induce a bias in the estimation of the cyclicality of remittances.

The GDP cycle is therefore instrumented by three variables which constitute plausible exclusion restrictions: the one-year lagged value of the GDP cycle, one-year lagged value of the domestic investment rate and contemporaneous terms of trade growth rate. Several arguments can be evoked to justify the choice of these variables. Firstly, the lagged values of

GDP cycle and investment rate would be correlated with the contemporaneous business cycle but not necessarily with remittances of the current period. Secondly, the terms of trade shocks have been highlighted as among the major determinants of GDP shocks in developing countries (Mendoza, 1997; Bleaney and Greenaway, 2001 et Aghion et al., 2009). It seems difficult to assess that terms of trade shocks will directly induce changes in the amount of remittances other than through the domestic income channel.

Generally, one would like estimate the following model for each country *i*:

$$\Delta \log(y_{i,t}) = \mathbf{Z}'_{i,t}\,\theta_{i,t} + \theta_{2i,t}\Delta \log(r_{i,t-1}) + \theta_{3i,t} + \upsilon_{i,t} \qquad (8)$$

$$\Delta \log(r_{i,t}) = a_{1i,t}\Delta \log(y_{i,t}) + a_{2i,t}\Delta \log(r_{i,t-1}) + a_{3i,t} + \varepsilon_{i,t} \qquad (9)$$

where $\Delta\log(r)$ and $\Delta\log(y)$ are the growth rate of real remittances and real GDP, respectively.[67] $\mathbf{Z}$ represents the matrix of instruments for the real GDP growth rate (one-year lagged value of GDP growth rate, one-year lagged value of the gross domestic investment and the contemporaneous terms of trade growth rate). Moreover, the model includes the lagged value of the remittance growth rate for at least two reasons. Firstly, by this way, we assume the existence of a stochastic trend in the remittance series and secondly, the lagged value of remittance growth rate controls for dynamic properties of the remittance growth rate. υ and ε are the error terms. *i* refers to the country and *t* to the year.

$a_{1i,t}$ measures the cyclicality of remittances. Note that a positive $a_{1i,t}$ means that remittances increase when the economy is in expansion, i.e. remittances are procyclical and the opposite holds for countercyclical remittances. Equation (8) refers to the first-stage instrumentation equation of the real GDP growth rate whereas equation (9) represents the structural model of

[67] Remittances series in US dollars are divided by the US deflator to convert them into real terms. The remittance series comprise the sum of workers' remittances and compensations of employees drawn from the World Bank Tables. The two items are used because for many countries, the distinction between the two is difficult (Bugamelli and Paternò, 2011). The paper retains only countries with at least 10 consecutive annual data of remittances over the period of analysis (1970-2008). The real GDP data also come from the World Bank Tables.

the cyclicality of remittances. In these equations, all the coefficients are both country-specific and time-varying. This is the value-added of this approach. But how can we compute time-varying country-specific parameters $a_{1i,t}$?

Several approaches can be used. One for example can use the ten-year centered window regressions to estimate the value of the parameter $a_{1i,t}$ at each year *t* and for each country *i*. This method however suffers from serious shortcomings. First, by definition, we lose the first five years and the last four years of data for each country. Second, because the method involves estimating a coefficient by discarding at each time period one old observation and taking into account a new one, the coefficient can vary substantially when the new observation is very different from the one it replaces. This implies that the series may be jagged and affected by noise and transitory changes (Aghion and Marinescu, 2008); moreover, a sudden jump in the series would not be coming from changes in the immediate neighborhood of date t, but from changes 5 years before and 4 years after.

To deal with the shortcomings of the 10-years rolling window method, one can use smoothing such that all observations are used for each year, but those observations closest to the reference year are given greater weight. The local Gaussian Weighted Ordinarily Least Squares (LGWOLS) is one way of achieving this. It consists of computing all the time-varying country-specific parameters in equations (8) and (9) coefficients by using all the observations available for each country *i* and then performing one regression for each date *t*, where the observations are weighted by a Gaussian centered at date *t* :

$$\Delta \log\left(y_{i,t}\right) = \mathbf{Z}'_{i,t}\,\theta_{i,t} + \theta_{2i,t}\Delta \log\left(r_{i,t-1}\right) + \theta_{3i,t} + \upsilon_{i,t}$$

$$\Delta \log\left(r_{i,t}\right) = a_{1i,t}\Delta \log\left(y_{i,t}\right) + a_{2i,t}\Delta \log\left(r_{i,t-1}\right) + a_{3i,t} + \varepsilon_{i,t}$$

where $\varepsilon_{i\tau} \sim N\left(0, {\sigma_\varepsilon^2}/{w_t(\tau)}\right)$, $\upsilon_{i\tau} \sim N\left(0, {\sigma_\upsilon^2}/{w_t(\tau)}\right)$ and $w_t(\tau) = \frac{1}{\sigma\sqrt{2\pi}} \exp\left(-\frac{(\tau - t)^2}{2\sigma^2}\right)$ (10)

In practice, we use $\sigma = 5$. The choice is made to obtain sufficient smoothing of the estimates. This value has been also preferred by Aghion and Marinescu (2008). The strength and the orthogonality of the instruments **Z** are evaluated according to tests of significance of the instrumental variables in the first-stage and according to the Hansen over-identification test.

The approach retained here therefore proceeds in two steps. Firstly, the cyclicality of remittances is evaluated by estimating for each country the equation (10) and secondly, we will use these indicators of cyclicality to examine the impact of trade openness on the countercyclicality of remittances.

4.3.3. Results

Evolution of the cyclicality of remittances

The results of the instrumentation of the real GDP growth are resumed in Figure 4.1. The figure reports the percentage of countries every year, for which the F-statistic in the first-stage regressions is significant (at least at 10%) as well as the percentage of cases with F-statistics above the rule of thumb of 10 (Staiger and Stock, 1997). It appears that the F-statistics associated with the instrumentation equations are significant in around 60% of cases. About half of these 60% corresponds to F-statistics above the rule of thumb of 10.

Figure 4.2 reports the percentage of cases with a Hansen test statistic exhibiting a p-value above 10% (the null hypothesis is the orthogonality of **Z**). The results indicate that in general, the instruments retained for the real GDP growth rate are not significantly correlated with the error term in the second stage.

Given the relatively comfortable results associated with the diagnostic tests, we can now turn to the main results regarding the computation of the cyclicality of remittances.

Figure 4.3 reports the percentage of cases for which remittances appear countercyclical as well as the percentage of cases in which the negative coefficient of the GDP growth rate is statistically significant. Two important results emerge. Firstly, the negative correlation of remittances vis-à-vis the GDP growth rate in the receiving countries has increased since the mid of 1990s and represent on average, about 50% of the countries. Our results highlight that remittances are more countercyclical than what has been found in previous papers. Secondly, the countercyclical behavior of remittances is statistically significant for about one-third of these 50% of cases. Whether this percentage of significant cases seems relatively low, this does not necessarily invalidate the idea that remittances may dampen the effects of external risk on government size. Indeed, we can conclude that remittances are often acyclical in the majority of cases and even acyclical remittances have potentially a stabilizing impact compared to procyclical remittances. Moreover, we will further in the paper take into account the heterogeneity in the significance of the parameters of the cyclicality of remittances by using the bootstrap procedure.

Does trade openness increase the countercyclicality of remittances?

The panel data of the cyclicality of remittances are used to investigate whether remittances are more likely to appear countercyclical as the degree of trade openness increases within countries. If external openness leads to some important risks that developing countries have to deal with, one would observe more countercyclical remittances in more open economies.

To test this hypothesis, an econometric model is specified with the cyclicality of remittances as a dependent variable and trade openness in the list of explanatory variables. The model also

controls for some other factors that could shape the cyclicality of remittances. The following model is used:

$$\widehat{a}_{1i,t} = \mathbf{X}'_{i,t}\,\beta + \theta\, op_{i,t} + u_i + \varepsilon_{i,t} \qquad (11)$$

with $\widehat{a}_{1i,t}$, the variable measuring the cyclicality of remittances, *op* the trade openness variable (drawn from the Penn World Tables 6.3., PWT) and **X** the matrix of potential control variables. u_i represents the country fixed-effects and $\varepsilon_{i,t}$ is the error term. The initial level of GDP per capita (the lagged value of GDP per capita in log drawn from PWT 6.3.) is introduced to control for the level of economic development. The lagged value of financial development (M2 over GDP), the inflation rate, public investment, the release of socio-economic information by the public authorities (Williams, 2009) and the number of natural disaster events occurred in each country are also added. Excepting the release of information, natural disasters, GDP per capita and trade openness, all the others variables are drawn from the World Bank Tables.

Financial development must be negatively correlated with the countercyclicality of remittances if we hypothesize that remittances play an insurance role in less financially developed countries. However, as it has been pointed-out by Giuliano and Ruiz-Arranz (2009), remittance inflows could exhibit a more procyclical behavior in less financially developed countries when they are used to finance productive activities in presence of credit constraints. Regarding the inflation rate, one could expect that remittances will exhibit a strong countercyclicality in a context of high inflation if the migrants respond to the collapse of the purchasing power of their siblings. We also expect a procyclical behavior of remittances in countries that release more essential socio-economic information to the public. Indeed, the transparency helps migrants who want to invest in their countries of origin by providing them with essential information. We thus expect a positive correlation between the

release of economic information and the procyclicality of remittances. The public investment ratio could be positively associated with remittances sent for financing private investment.[68] Finally, natural disasters measured as the number of disaster events would be associated with more countercyclical remittances given that altruistic migrants react strongly to natural disasters occurred in their countries of origin (Yang, 2008; Mohapatra et al., 2009, and David, 2010). Data on natural disasters are drawn from the Center for Research on the Epidemiology of Disasters (CRED) – Emergency Events Database (EM-DAT).

The equation (11) is estimated over the period 1970-2008 with annual data. The hypothesis tested is that $\theta < 0$. In other terms, trade openness increases the countercyclicality of remittances. Descriptive statistics and the list of country in the sample are presented in appendix.

The results of the estimations are presented in Table 4.1. Whatever the control variables that are introduced, the results suggest a negative and statistically significant impact of trade openness on the cyclicality of remittances. This result validates the hypothesis that remittances are more likely to play an insurance role in more open economies by insulating the private sector against the external risks. Regarding the other determinants of the cyclicality of remittances, the results uncover a significant association between natural disasters, inflation rate and the countercyclicality of remittances. In contrary, more public investment and financial development are associated with procyclical remittances.[69]

To sum up, this section has highlighted two important results: on average, remittances are countercyclical and this countercyclicality increases with the level of trade openness. The next

[68] Data on public investment are drawn from IMF World Economic Outlook database (2010).
[69] However, the low value taken by the coefficient of determination suggests that the results would be taken with some hindsight. This can be explained by at least two reasons. Firstly, there are some unobservable time-varying variables that can determine the cyclicality of remittances but for which we didn't control for. Secondly, we are explaining a variable which changes year by year with some explanatory variables which change slightly over the time (openness, financial development, income).

sub-section tests the hypothesis that the level of remittances really matters in the relationship between government size and trade openness and section 5 directly investigates the effect of countercyclical remittances on this relationship.

4.4. Remittances, openness and government size: Econometric analysis

4.4.1. The econometric model

This section presents the econometric model that is specified to measure the impact of remittance inflows on the sensitivity of government consumption ratio with respect to trade openness. The hypothesis tested is that the effect of openness on government consumption will be less positive at high levels of remittances. The following equation is estimated:

$$g_{i,\tau} = \rho g_{i,\tau-1} + \mathbf{X}'_{i,\tau}\beta + \theta_1 r_{i,\tau} + \theta_2 op_{i,\tau} + \theta_3 \left(op_{i,\tau} \times r_{i,\tau}\right) + \alpha_i + \eta_\tau + \varepsilon_{i,\tau} \qquad (12)$$

where *g* represents the government consumption ratio, **X** is the matrix of control variables (GDP per capita, demographic dependency ratio, urbanization rate, inflation rate and population size). *op* is the indicator of trade openness and *r* the remittance variable. α_i and η_τ are respectively the country fixed-effects and the period dummies. $\varepsilon_{i,\tau}$ is the error term. All the time-varying variables are expressed in their natural logarithmic form. The model includes the lagged value of government consumption to capture the inertia in the government spending ratio.

The hypothesis tested is that the marginal impact of trade openness on government consumption $\left(\theta_2 + \theta_3 r_{i,\tau}\right)$ is less positive at high levels of remittances. More precisely, our claim is that $\theta_2 > 0$ and $\theta_3 < 0$. Because the two coefficients are expected to exhibit opposite signs, a threshold level of remittances arises:

$$\frac{\partial g_{i,\tau}}{\partial op_{i,\tau}} = \theta_2 + \theta_3 r_{i,\tau} = 0 \Rightarrow r^* = -\frac{\theta_2}{\theta_3}$$

r^* measures the minimum remittance ratio (expressed in log terms) required for a full absorption of the effect of trade openness.

4.4.2. The sample and the variables

The sample includes 66 developing countries observed over 8 non-overlapping periods consisting of 5-year intervals, over 1970-2008. This sample of countries is the same as the one used to compute the coefficients of cyclicality.

Government consumption data are normalized by country GDP and were drawn from the Penn World Table 6.3.[70] We follow the World Bank in defining remittances as the sum of workers' remittances and employees' compensations. We use the sum of these two items because for many developing countries the statistical distinction between the two could be highly problematic (Bugamelli and Paternò, 2011). Two alternative measures are used: real remittances per capita and remittances normalized by country GDP. Trade openness is defined as the sum of exports and imports of goods and services over GDP. Data come from the Penn World Table 6.3. Data for all the remaining explanatory variables are drawn from the World Bank Tables.

4.4.3. Estimation method

The System-GMM estimator is used to estimate the parameters of equation (12). Two reasons justify this choice. Firstly, since the equation (12) is autoregressive and includes country-fixed effect, OLS estimator is biased and this bias is particularly important in the case of short time

[70] Government consumption ratio is used as the indicator of government size due to the lack of available data on the composition of government expenditures. Moreover, this variable has been used by Rodrik (1998) in his analysis of the effect of trade openness on government size. Due to the absence of effective systems of social security in developing countries, governments often use government consumption to mitigate negative shocks (for example by hiring more people in the administration or by increasing demand for furniture supplied by the private sector). These activities are captured in the government final consumption.

dimension as in our case (8 sub-periods). Secondly, the System-GMM estimator allows to correct the endogeneity of the explanatory variables. The equation in levels and the equation in first differences are combined in a system and estimated with an extended GMM estimator system which allows for the use of lagged differences and lagged levels of the explanatory variables as instruments (Blundell and Bond, 1998). The paper uses the Windmeijer's (2005) correction of standard errors for finite sample bias. Two specification tests check the validity of the instruments. The first is the standard Sargan/Hansen test of over-identifying restrictions. The second test examines the hypothesis that there is no second-order serial correlation in the first-differenced residuals. The number of lags of the explanatory variables used as instruments is usually limited to reduce the 'over-fitting' bias (Roodman, 2009).

4.4.4. Results

The results are reported in Table 4.2 and Table 4.3. The model is primarily estimated using remittances per capita (Table 4.2) and using remittances as share of GDP, afterwards (Table 4.3). In all these estimations, the diagnostic tests associated with the system-GMM estimator are conclusive.

In Table 4.2, the results suggest a positive and significant impact of trade openness on the government consumption ratio. Given that all the explanatory variables are expressed in logarithm terms, the parameters reported approximate the elasticities. In a situation of zero remittances, the impact of trade openness on the government consumption is represented by the coefficient of the additive term of openness and stands between 0.1 and 0.2. On the basis of the results obtained with the full set of control variables (column 6), a 10% increase in openness is associated with a 1% increase in the government consumption ratio over GDP.[71] When trade openness is interacted with remittances per capita, its impact on government spending is negative and statistically significant.

[71] This result is not highly different to what was found by Rodrik (1998). He estimated an elasticity around 0.2.

The other result that is reported in the Table 4.2 suggests a positive impact of the additive term of remittances on the government consumption ratio. This coefficient identifies the effect of remittances on government spending in a context of autarky (openness equals zero). In this specific case, remittances are not used as a compensation mechanism against external risks but finance investments on education or other forms of demand for public services which therefore increase government size.

The level of remittances per capita required to fully offset the effect of trade openness on government spending is evaluated between 20 and 40 $US per capita. About 50% of the sample is concerned (country-year observations). On the basis of the results obtained in column 6, some basics simulations can be performed. In a situation with zero remittance inflows, the impact of openness on government consumption can be obtained with the following calculation. The median value of government consumption and trade openness ratios are 16% and 59%, respectively. A country for which trade openness moves from its median value toward 80% (an increase of 35%) would observe an increase of the government consumption ratio by about 0.5 percentage point of GDP – (0.101×0.35×0.16) ×100 –, a shift in the government consumption ratio from 16 to 16.5%. However, if the same country receives a level of remittances per capita corresponding to the median value in the sample (12 $US) for which the logarithm is 2.5, this country will observe a variation of the government consumption of 0.17 percentage point of GDP– [(0.101×0.35) – (0.028×0.35×2.5)]×0.16×100 – a shift from 16% to 16.17%. The reduction of government size enabled by remittances in this example is about 0.33 percentage point of GDP.

To check the robustness of this result, the same model is estimated using the remittance-to-GDP ratio. Results are reported in Table 4.3 and appear broadly consistent with the previous ones. Again, trade openness determines positively the government consumption, and this effect is strongly dampened by remittance inflows. Results indicate that the threshold level of

remittances required for a full absorption of the effects of trade openness on the government size stands around 4.5 and 8% of GDP. On the basis of the parameters estimated with the full set of control variables (column 6), the threshold of remittances stands at 6% and concerns 46% of the sample of country-year observations.

Perhaps a better sense of the quantification of this result can be obtained from the following calculation. A country for which trade openness moves from the median value to 80% (a 35% increase) would observe a shift of the government consumption ratio of about 0.8 percentage point of GDP ((0.137×0.35×0.16)×100). However, if the same country receives the median value of the remittance ratio (2.4% of GDP) for which the logarithm stands at 0.9, the variation in percentage point of GDP of the government consumption ratio would only be around 0.4 ([(0.137×0.35) – (0.079×0.35×0.9)]×0.16×100). The reduction in the government consumption enabled by remittance inflows is 0.4 in this example, a value close to what was found in the case of the results with remittances per capita.

4.5. Remittance cyclicality, openness and government size

This section extends the previous one by directly investigating whether countercyclical remittances reduce the positive impact of trade openness on government consumption. The time-varying coefficients measuring the cyclicality of remittances are used and the following equation is specified:

$$g_{i,\tau} = \rho g_{i,\tau-1} + \mathbf{X}'_{i,\tau}\beta + \theta_4 \hat{a}_{1i,\tau} + \theta_5 op_{i,\tau} + \theta_6 \left(op_{i,\tau} \times \hat{a}_{1i,\tau}\right) + \alpha_i + \eta_\tau + \varepsilon_{i,\tau} \qquad (13)$$

The hypothesis tested is that $\theta_6 > 0$ so that the effect of trade openness on the government consumption is less positive in the case countercyclical remittances ($\hat{a}_{1i,\tau} < 0$). It is worth noting that the additive term of trade openness does not identify the effect of openness on

government consumption in a situation without remittances, but the effect in the case of acyclical remittances ($\widehat{a}_{1i,\tau} = 0$).

The results of the estimation of the equation (13) are presented in Table 4.4. As expected, the interaction of trade openness with the indicator of the cyclicality of remittances exhibits a positive and significant coefficient. This result suggests that countercyclical remittances (a negative value of $\widehat{a}_{1i,\tau}$) significantly reduce the elasticity of government consumption with respect to trade openness. The opposite holds for procyclical remittances.

Since the coefficients measuring the cyclicality of remittances have been previously 'generated' from an econometric model, using them as explanatory variable in equation (13) can bias the results. To take into account the bias due to generated regressors, the model (13) is estimated anew and the standard-errors of the coefficients associated with the cyclicality of remittances are corrected using a bootstrap procedure with 100 replications. The procedure is applied to the model including the full set of control variables. Results show that the significance of the parameters is not altered by this correction (Table 4.5).

4.6. Concluding remarks

This chapter showed robustly that remittance inflows dampen the positive effect of trade openness on government spending in developing countries. Moreover, this effect is likely to be observed in the case of countercyclical remittance inflows. Starting from a simple theoretical model, then on the basis of econometric investigations factoring in the endogeneity of remittances, the results indicate that when remittances exceed 6% of GDP, they fully absorb the positive effect of trade openness on government consumption.

Because this result is theoretically justified by assuming countercyclical remittance inflows, the paper proposes an empirical evaluation of the countercyclicality of remittances by

computing time-varying country-specific indicators of remittance cyclicality for each country and at each year using Local Gaussian Weighted Ordinarily Least Squares estimations. The results indicate a surge in the countercyclicality of remittances during the mid of 1990s. It also appears that trade openness increases the inflow of more countercyclical remittances, supporting the idea of an insurance role played in small open economies. The econometric analyses also do not reject the hypothesis that countercyclical remittances induce a fiscal retrenchment in more open economies.

This paper showed how the relationship between globalization and fiscal policy differs among countries with differences in their balance of payment characteristics. Remittance inflows reduce the role of insurer of last resort often played by governments in developing countries.

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Figure 4.1. Testing the strength of the instruments: summary of first-stage results

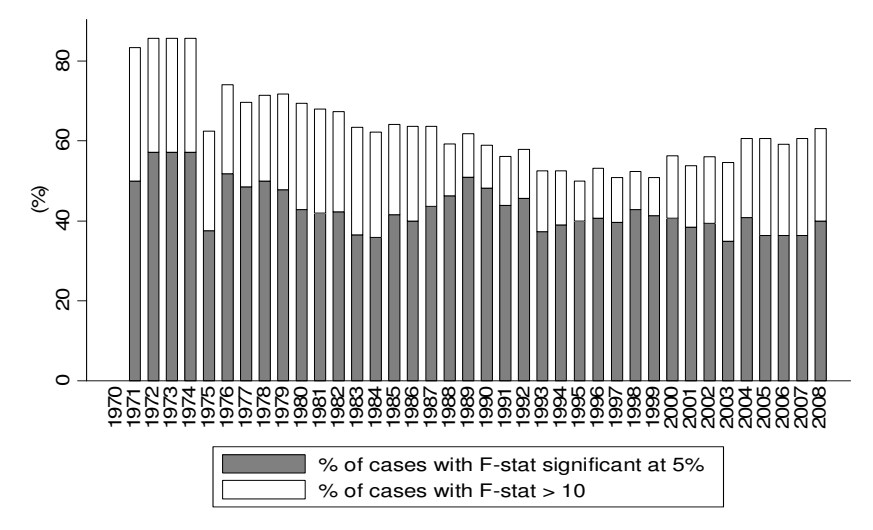

Figure 4.2. Testing the orthogonality of the instruments: summary of first-stage results

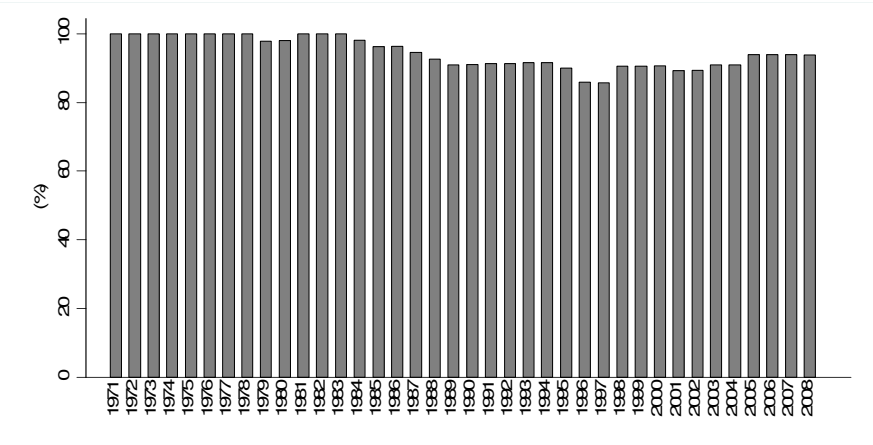

Figure 4.3: Evolution of the countercyclicality of remittances

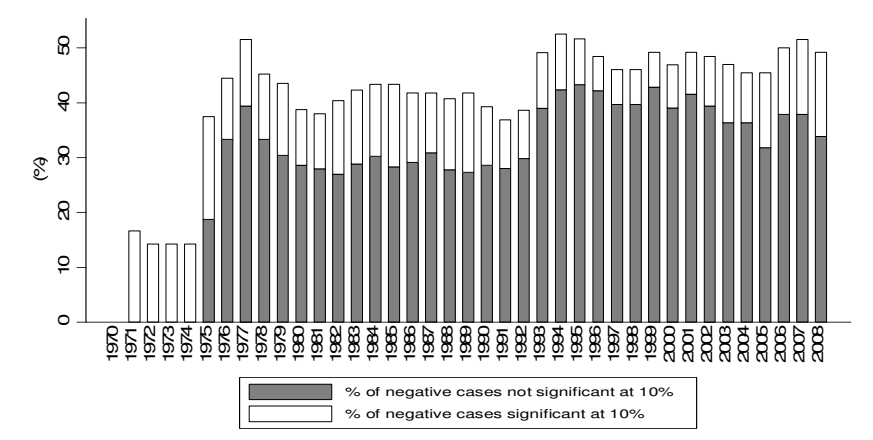

Table 4.1: Trade openness and the procyclicality of remittances: OLS with country fixed-effects estimator.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Trade openness	-2.347**	-2.900***	-2.702***	-2.886***	-2.780**	-2.256**	-1.980*	-2.226*
	(2.49)	(2.86)	(2.70)	(2.71)	(2.37)	(2.18)	(1.70)	(1.80)
Lagged GDP per capita	-0.650	0.098	-0.278	-0.518	1.793	1.104	1.808	1.600
	(0.54)	(0.07)	(0.21)	(0.36)	(1.09)	(0.80)	(1.11)	(0.90)
Inflation rate		-3.126***	-3.172***	-2.875***	-3.409***	-3.229***	-3.341***	-3.208***
		(2.83)	(2.96)	(2.63)	(3.01)	(2.93)	(3.09)	(2.99)
Lagged Financial development			0.545				1.799*	1.916*
			(0.76)				(1.84)	(1.96)
Release of information				2.638				-1.382
				(0.50)				(0.24)
Public investment					2.520***		2.621***	2.189***
					(3.78)		(4.08)	(3.31)
Natural disasters						-0.373***	-0.269**	-0.336**
						(2.91)	(1.97)	(2.33)
Intercept	17.367*	28.104**	28.513**	30.202**	10.700	18.752	1.108	4.526
	(1.86)	(2.35)	(2.45)	(2.41)	(0.75)	(1.52)	(0.08)	(0.30)
Observations	1839	1696	1683	1568	1453	1696	1440	1315
Countries	67	65	65	65	65	65	65	65
R^2	0.005	0.008	0.009	0.009	0.019	0.014	0.026	0.026

Note: *T*-statistics in parentheses. All the explanatory variables are expressed in their logarithmic form. For the inflation rate, we use the log of 100+the inflation rate. Financial development is the logarithm of M2 in percentage of GDP. Natural disasters record the number of natural disaster events in each country each year (CRED-EM-DAT). The models include country fixed-effects. The release of socio-economic information by Governments is drawn from Williams (2009). *** p<0.01, ** p<0.05, * p<0.1.

Table 4.2: Remittances per capita, Openness and Government consumption

	(1)	(2)	(3)	(4)	(5)	(6)
Trade openness	0.135**	0.108*	0.116*	0.137**	0.116*	0.101*
	(2.16)	(1.81)	(1.84)	(2.12)	(1.67)	(1.71)
Trade openness*Remittances	-0.041**	-0.033**	-0.037**	-0.041**	-0.033*	-0.028*
	(2.38)	(2.12)	(2.08)	(2.41)	(1.91)	(1.93)
Remittances per capita	0.142**	0.107**	0.132*	0.141**	0.117*	0.103**
	(2.01)	(2.01)	(1.85)	(2.02)	(1.78)	(2.02)
Government consumption (t-1)	0.903***	0.832***	0.914***	0.907***	0.906***	0.805***
	(7.69)	(10.52)	(8.39)	(7.39)	(7.76)	(6.37)
Inflation	0.168***	0.133***	0.158***	0.167***	0.137***	0.097***
	(2.59)	(2.58)	(2.72)	(2.58)	(2.84)	(2.61)
GDP per capita		0.065				0.079
		(1.17)				(1.03)
Urbanization rate			-0.052*			-0.117*
			(1.89)			(1.90)
Population				-0.002		0.010
				(0.26)		(0.66)
Demographic dependency ratio					-0.166	0.275
					(1.19)	(1.20)
Intercept	-0.984**	-1.053	-0.716	-0.961*	-0.182	-1.683
	(2.03)	(1.64)	(1.42)	(1.83)	(0.30)	(1.15)
Observations	396	396	396	396	391	391
Countries	66	66	66	66	65	65
Joint significance prob.[a]	0.026	0.100	0.092	0.024	0.158	0.129
Joint significance prob.[b]	0.044	0.080	0.100	0.039	0.141	0.097
Remittances per capita [c]	26 $US	26.5 $US	23 $US	28 $US	34 $US	38 $US
Countries above the threshold	40	40	41	38	35	31
Percentage of countries above	61%	61%	62%	58%	54%	48%
AR(1):p-value	0.001	0.001	0.001	0.001	0.001	0.004
AR(2):p-value	0.774	0.774	0.780	0.760	0.855	0.771
Hansen OID test: prob.	0.762	0.661	0.690	0.736	0.302	0.441
Instruments	32	37	33	33	25	47

Note : All the variables are expressed in natural logarithm. Period dummies are included in all the specifications. Robust *T*-statistics in parentheses. Urbanization rate, population, dependency ratio and period dummies are taken as strictly exogenous. The remaining control variables are taken as predetermined and the matrix of instruments is collapsed and the maximum number of lags is fixed at 5. The estimation method is the two-step System-GMM method with the Windmeijer (2005) correction for finite sample bias. Data are computed as 5-year averages corresponding at 8 nonoverlapping sub-periods.

[a] Joint significance probability of coefficients associated with remittances and remittances crossed with trade openness.

[b] Joint significance probability of coefficients associated with trade openness and remittances crossed with trade openness.

[c] Threshold level of remittance (expressed in per capita $US terms) at which the effect of trade openness on government consumption is equal to zero.

*** p<0.01, ** p<0.05, * p<0.1.

Table 4.3: Remittances (%GDP), Trade openness and Government consumption

	(1)	(2)	(3)	(4)	(5)	(6)
Trade openness	0.148**	0.188**	0.127*	0.220***	0.119*	0.137*
	(2.05)	(2.50)	(1.72)	(2.66)	(1.90)	(1.82)
Trade openness*Remittances	-0.094**	-0.093**	-0.086*	-0.101**	-0.089*	-0.079*
	(2.31)	(1.97)	(1.93)	(2.18)	(1.75)	(1.66)
Remittances (%GDP)	0.349**	0.336*	0.315	0.377*	0.343	0.299
	(1.97)	(1.66)	(1.63)	(1.90)	(1.60)	(1.48)
Government consumption (t-1)	0.925***	0.922***	0.929***	0.934***	0.927***	0.898***
	(9.08)	(7.73)	(10.16)	(10.38)	(9.47)	(8.69)
Inflation	0.139**	0.171**	0.128**	0.144**	0.121**	0.111*
	(2.36)	(2.50)	(2.02)	(2.22)	(2.17)	(1.71)
GDP per capita		-0.042*				-0.011
		(1.94)				(0.34)
Urbanization rate			-0.052**			-0.025
			(2.16)			(0.82)
Population				0.021*		0.007
				(1.77)		(0.46)
Demographic dependency ratio					0.079	-0.044
					(0.62)	(0.18)
Intercept	-1.028*	-0.980	-0.702	-1.728**	-1.128	-0.535
	(1.79)	(1.63)	(1.21)	(2.46)	(1.54)	(0.42)
Observations	395	395	395	395	390	390
Countries	66	66	66	66	65	65
Joint significance prob.[a]	0.011	0.031	0.020	0.017	0.100	0.143
Joint significance prob.[b]	0.038	0.029	0.100	0.020	0.118	0.117
Remittances (%GDP) [c]	5%	7.5%	4.5%	9%	4%	6%
Countries above the threshold	33	22	33	19	35	30
Percentage of countries above	50%	33%	50%	29%	54%	46%
AR(1):p-value	0.001	0.002	0.001	0.001	0.001	0.001
AR(2):p-value	0.694	0.671	0.709	0.599	0.794	0.779
Hansen OID test: prob.	0.801	0.468	0.767	0.895	0.683	0.634
Instruments	28	41	29	25	27	35

Note: All the variables are expressed in natural logarithm. Period dummies are included in all the specifications. Robust *T*-statistics in parentheses. Urbanization rate, population, dependency ratio and period dummies are taken as strictly exogenous. The remaining control variables are taken as predetermined and the matrix of instruments is collapsed and the maximum number of lags is fixed at 5. The estimation method is the two-step System-GMM method with the Windmeijer (2005) correction for finite sample bias. Data are computed as 5-year averages corresponding at 8 nonoverlapping sub-periods.

[a] Joint significance probability of coefficients associated with remittances and remittances crossed with trade openness.

[b] Joint significance probability of coefficients associated with trade openness and remittances crossed with trade openness.

[c] Threshold level of remittance (expressed in %GDP) at which the effect of trade openness on government consumption is equal to zero.

*** p<0.01, ** p<0.05, * p<0.1.

Table 4.4. Remittance cyclicality, Openness and Government Consumption

	(1)	(2)	(3)	(4)	(5)
Trade openness	-0.026	-0.023	-0.025	-0.029	0.019
	(0.62)	(0.55)	(0.50)	(0.66)	(0.28)
Trade openness*Remittance cyclicality	0.003**	0.003**	0.003**	0.004**	0.004***
	(2.08)	(2.00)	(2.03)	(2.25)	(2.61)
Remittance cyclicality	-0.013**	-0.012**	-0.014*	-0.016**	-0.019**
	(2.06)	(2.03)	(1.94)	(2.23)	(2.57)
Government consumption (t-1)	0.634***	0.642***	0.621***	0.591***	0.465***
	(4.56)	(5.28)	(3.93)	(3.83)	(3.59)
Inflation	-0.016	-0.003	-0.024	-0.017	-0.028
	(0.31)	(0.06)	(0.49)	(0.30)	(0.51)
GDP per capita	-0.018	0.034	-0.015	-0.017	0.057
	(0.74)	(1.48)	(0.60)	(0.49)	(1.24)
Urbanization rate		-0.109***			-0.095*
		(2.67)			(1.79)
Population			0.013		0.057
			(0.54)		(1.24)
Demographic dependency ratio				0.066	0.374
				(0.55)	(1.21)
Intercept	1.351***	1.231***	1.275**	1.236	-0.528
	(2.77)	(2.78)	(2.15)	(1.48)	(0.28)
Observations	384	384	384	380	380
Countries	66	66	66	65	65
Joint significance prob.[a]	0.113	0.127	0.104	0.079	0.033
Joint significance prob.[b]	0.114	0.135	0.126	0.079	0.010
AR(1):p-value	0.018	0.012	0.024	0.028	0.042
AR(2):p-value	1.000	0.993	0.985	0.900	0.996
Hansen OID test: prob.	0.362	0.563	0.335	0.219	0.644
Instruments	20	21	25	21	27

Note: All the variables are expressed in natural logarithm. Period dummies are included in all the specifications. Robust *T*-statistics in parentheses. Urbanization rate, population, dependency ratio and period dummies are taken as strictly exogenous. The remaining control variables are taken as predetermined and the matrix of instruments is collapsed and the maximum number of lags is fixed at 5. The estimation method is the two-step System-GMM method with the Windmeijer (2005) correction for finite sample bias. Data are computed as 5-year averages corresponding at 8 nonoverlapping sub-periods.

[a] Joint significance probability of coefficients associated with remittance cyclicality and remittance cyclicality crossed with trade openness.

[b] Joint significance probability of coefficients associated with trade openness and remittance cyclicality crossed with trade openness.

*** p<0.01, ** p<0.05, * p<0.1.

Table 4.5: Bootstrapped standard-errors

Variable	Coefficient observed (column 5, Table 4.6)	Bias	Bootstrapped standard-error
Remittance cyclicality	-0.019*	0.0167	0.0111
Openness*Remittance cyclicality	0.0045*	-0.0038	0.0027

Note: The bootstrap procedure uses 100 replications
* p<0.1.

Appendix D: Descriptive statistics and list of countries in the sample

Table D1: Descriptive statistics

Variables	Obs	Mean	Std-dev.	Minimum	Maximum
			Annual data		
Cyclicality of remittances	1910	2.62	13.94	-26.49	124.76
Terms of trade growth rate	1755	-0.01	0.13	-0.98	1.42
Lagged Gross domestic investment ratio	2350	20.83	7.65	-23.76	70.81
Remittance growth rate	1943	0.08	0.42	-3.24	3.89
GDP growth rate	2434	0.04	0.05	-0.70	0.33
Release of information by Governments	2405	0.58	0.13	0.08	0.86
Public investment ratio	1759	1.69	0.89	-5.33	4.55
Inflation rate	2306	4.76	0.32	4.48	10.11
Trade openness	2546	4.06	0.60	2.17	5.47
Financial development (M2 (% GDP))	2466	3.32	0.61	-0.09	9.31
			5-year averages		
Trade openness	536	4.07	0.59	2.37	5.36
Remittances per capita [a]	449	2.17	2.02	-2.91	6.35
Remittances (% GDP) [a]	442	1.05	0.88	0	4.40
Cyclicality of remittances	420	2.53	13.58	-26.30	108.05
Government consumption	536	2.79	0.49	0.76	4.11
Inflation [a]	484	4.76	0.27	4.57	7.73
Urban	544	3.53	0.60	1.26	4.53
Population	536	9.16	1.75	4.03	14.09
Dependency ratio	536	3.79	0.12	3.37	3.97
GDP per capita	536	8.04	0.81	6.40	9.86

Note : All the variables are expressed in their logarithmic form except the release of information index, natural disasters, remittance and GDP growth rates and the cyclicality of remittances.

[a] series expressed as the logarithm of 1 + the original values of the series to deal with zeroes and negative values.

Table D2. List of countries (67)

Algeria	Dominican Republic	Lesotho	Philippines
Argentina	Ecuador	Madagascar	Rwanda
Bangladesh	Egypt	Malawi	Senegal
Benin	El Salvador	Malaysia	Seychelles
Bolivia	Ethiopia	Mali	South Africa
Botswana	Fiji	Mauritania	Sri Lanka
Brazil	Gabon	Mauritius	Sudan
Burkina Faso	Gambia	Mexico	Swaziland
Cameroon	Ghana	Morocco	Tanzania
Cape Verde	Guatemala	Mozambique	Thailand
Chile	Guinea	Namibia	Togo
China	Haiti	Nicaragua	Tunisia
Colombia	Honduras	Niger	Turkey
Comoros	India	Pakistan	Uganda
Congo, Rep.	Indonesia	Panama	Venezuela
Costa Rica	Jordan	Paraguay	Zimbabwe
Cote d'Ivoire	Kenya	Peru	

Chapter 5. Do remittances lead to a public moral hazard?[72]

[72] A version of this chapter is forthcoming at the *Journal of Development Studies*

5.1. Introduction

International migration constitutes one of the biggest aspects of the current economic globalization. One of the main consequences of migration is remittances, in others words the money sent back to home by migrants. Remittances constitute a significant amount of the resources received by developing countries, and some scholars argue that remittances are an external and stable source of funding for development (Ratha, 2005). To put some numbers in perspective, the level of remittances attained 338 billion US dollars in 2008. And despite the recent worldwide crisis, remittances have shown a stronger comparative resilience than the other types of financial flows received by developing countries. Moreover, for a number of countries, remittances represent the most important source of external funding, exceeding the levels of foreign aid or foreign direct investment (Ratha, 2009). The level of remittances exceeds that of aid in the whole developing world and they represent the second largest external source of funding after foreign direct investment.

The literature on the contribution of remittances to development can be split into two broad camps: on one side, the club of optimists and on the other side, the club of sceptics. Taking an optimistic view, remittances contribute to the development of recipient countries by relieving households' financial constraints, and by protecting them against several types of shocks. Overall, remittances enhance economic growth, reduce poverty and help cope with shocks (Adams, 2005; Yang, 2008; Gupta et al., 2009; Giuliano et al., 2009; Bugamelli and Paternò, 2011; Chami et al., 2009).

For the sceptics, remittances are simultaneously a gift and a curse. By leading to an appreciation of the real exchange rate, or by reducing labor force participation in recipient country households, remittances do not contribute to economic development in the long run (Amuedo-Dorantes and Pozo, 2004; Chami et al., 2003; Chami et al., 2005). The main

motivation of these "sceptical" papers is to show that remittances are not a panacea, and that sometimes they may harm sustainable economic growth. For example, Catrinescu et al. (2009) seek to explain the ambiguity among studies on the impact of remittances on economic growth by relating the effect of remittances to the quality of domestic institutions in recipient countries. Specifically, they show that remittances are more likely to contribute to longer-term growth when the remittance receiving countries' political and economic policies and institutions create the incentives for financial and business investment and savings from remittances.

Amuedo-Dorantes and Pozo (2004), using a sample of Caribbean and Latin American countries, showed that a rise in remittances is associated with an appreciation of the real exchange rate. Chami et al. (2003) and Chami et al. (2005) pointed out that remittances create a moral hazard problem between the migrant and the recipient household when the latter has the incentive to reduce its labor force participation while increasing its leisure time.

A recent part of this literature explores the negative side-effects of remittances by questioning the contribution of these flows to economic policy. Shabbaz et al. (2008) investigate the relationship between the surge in remittances and government spending in Pakistan. They tested the hypothesis that remittances reduce the size of government by insulating both government and domestic population from the vagaries of the global economy. This idea has been documented in Kapur and Singer (2006).

Abdih et al. (2008) using a large sample of developing countries, and after factoring in the endogeneity of remittances, have shown that remittances reduce institutional quality in recipient countries. This arises because the access to remittance income makes government corruption less costly for domestic households to bear; consequently corruption is likely to increase.

Grabel (2009) pointed out that remittances may create a 'public moral hazard' on the part of developing country governments. That is, by partially resolving bottlenecks, remittances may actually encourage states in the developing world to ignore their traditional responsibilities because they assume that remittances will fill various voids.

Chami and Fullenkamp (2009) propose a more severe analysis of the effects of remittances in recipient countries. They argue that if conditions are bad at home, families send more members abroad and use remittance income to compensate for the lack of government services. Therefore, they lose interest in pressuring the government to deliver better services, and the quality of government declines because the government does not feel compelled to provide services as it realizes that households can fend for themselves.

This paper extends the previous analyses on the relationship between remittances and government behavior in recipient countries. We investigate what happens on the part of the public sector when remittances flow into countries characterized by bad governance. We test the hypothesis of the existence of a 'public moral hazard problem' by examining the effects of remittances inflows on the levels of public social spending when the government is not accountable. The hypothesis is validated when remittance inflows reduce government spending on social sectors. We propose the hypothesis that this behavior is more likely to be observed in countries when the public sector is not accountable.

This can be explained by at least three arguments. Firstly, remittances constitute a form of private subsidy, and therefore bad governments can easily reduce public subsidies on these sectors. Secondly, access to remittances income makes a reduction of government subsidies less costly for domestic households to bear, a situation that might be exploited by rogue governments to divert resources. Thirdly, access to remittances income might reduce the incentive for recipients' households to exert accountability on governments. It is then

plausible that individuals do not exert pressure on government for change simply because they can resort to remittances to solve their problems. Therefore, it is as if people renounce pressure for change more easily if they can receive an external assistance like remittances. This is also a form of moral hazard problem on the part of households which translates into a public moral hazard problem.

A large sample of developing countries is retained in order to test the impact of remittances on social public subsidies. The period of analysis is 1996-2007 and the unit of observation is the country. This period is retained for a number of reasons. As in Abdih et al. (2008), we use as my main dimensions of governance and accountability, all the indicators provided by Kaufmann et al. (2009) in the World Bank Governance Indicators dataset.

We take advantage of the panel data structure of the dataset to estimate the effect of remittances on public social spending. Because remittances are plausibly endogenous and because public spending on social sectors is strongly autoregressive, the system-GMM estimator is useful to permit the reduction of the bias associated with the estimation of the autoregressive models as well as to instrument remittances with their lagged values. For robustness checks, we also present the results obtained from an augmented system-GMM estimator which includes an external instrument for remittances and which allows a common factor representation, and results from the difference-GMM estimator.

The results of the econometric analyses do not reject the hypothesis of this paper. It appears that remittances reduce public spending on education and health in countries 'badly' governed.

The remainder of the chapter is as follows: Section 2 presents the econometric model of the relationship between remittances, governance and public spending, Section 3 discusses the

results of estimations and provides empirical regularities, Section 4 checks the robustness of these results and we conclude with policy implications in Section 5.

5.2. Empirical design

5.2.1. Econometric specification

The model specified is designed to measure the impact of remittances on the level of public spending on education and health among different levels of governance. For the choice of control variables, we take advantage of previous empirical models of the determinants of public spending on education and health in developing countries. These models are augmented with linear and multiplicative terms of remittances, and remittances crossed with the governance variables. Formally, the specification retained is the following:

$$S_{it} = S\left(R, R*G, G, X\right) \qquad (1)$$

where S is either the overall measure of social spending, public spending on education or public spending on health in percent of GDP. R is remittances as a percentage of GDP, and G is the index of governance quality. All the variables are expressed in the natural logarithmic form except the governance variables.

By controlling additively for the levels of remittances and governance quality, we ensure that the interaction term does not proxy for remittances or the level of institutional quality. This is an important point because remittances may have a direct effect on the quality of domestic institutions as has been shown by Abdih et al. (2008). The impact that we identify here is however the influence of remittances on the level of public pro-poor expenditures in countries with governance problems.

The model estimated with a yearly panel data structure is a dynamic panel data model with the following form:

$$S_{i,t} = \rho S_{i,t-1} + X'_{i,t}\beta + \theta_1 R_{i,t} + \theta_2 R_{i,t} * G_{i,t} + \theta_3 G_{i,t} + u_i + \varepsilon_{i,t} \qquad (2)$$

with u_i the country fixed effects.

A dynamic specification is used given the strong inertia characterizing government spending, which is often renewed every year in budgets. The hypotheses tested are that remittances (*R*) are negatively associated with public spending on education and health at high levels of bad governance (existence of a public moral hazard effect due to remittances). Formally, this suggests that $\theta_2 < 0$ and $\theta_3 < 0$.[73]

Remittances are suspected of endogeneity because of omitted variables bias and reverse causality. Indeed, there exist some variables which might affect both remittances and public spending. For example, external shocks could influence remittances as well as the level of public social spending. Another omitted variable is the level of emigration, which is directly linked to remittances, and also affects the propensity of government to subside social sectors. Moreover, emigration of individuals decreases the domestic tax base, government tax revenue and its capacity to supply public services.[74] Finally, endogeneity of remittances may also arise because of reverse causality. If the level of public spending on education or health is too low to permit households to use services, remittances can be sent to increase the access of recipient households to health care services or education (e.g. in the private sector). Moreover, a low level of public spending, which results in a low quality of public services, could encourage households to use remittances in the private sector, where the quality of similar services (e.g. schools, private clinics) is expected to be higher. Altogether, it can be expected that the coefficients associated with remittances in OLS estimations will be downward biased.

[73] *G* is an indicator of governance quality with high values corresponding to a bad governance score.
[74] Docquier et al. (2008) have recently shown in a cross-sectional analysis, a negative impact of skilled migration on public subsidies for education: the average elasticity of public education subsidies to skilled migration rates amounts to − 0.20.

Hence an econometric strategy based on instrumental variables must be implemented. We therefore resort to dynamic panel data estimators that allow the instrumentation of the explanatory variables suspected of endogeneity. Two commonly used estimators are retained: the difference-GMM estimator (Arellano and Bond, 1991) and the system-GMM estimator (Arellano and Bover, 1995; Blundell and Bond, 1998).[75] In the difference-GMM estimator, the model (2) is taken in first differences (to remove country fixed effects), and the first differentiated variables are instrumented by the lagged values of the variables in level. However, it has been recognized that the lagged values of variables in level are sometimes poor instruments for variables in first differences. The system-GMM estimator therefore increases the moment conditions in order to improve the efficiency. The equation in levels and the equation in first differences are combined in a system, then estimated with an extended GMM estimator system which allows for the use of lagged differences and lagged levels of the explanatory variables as instruments.

The GMM estimators designed for dynamic panel data are suitable to deal with endogeneity problems arising from simultaneity bias but also from reverse causality. Regarding the latter case, if low levels of public education and health expenditures increase the level of remittances sent to a country (because migrants may remit more to countries with low levels of public spending on education and public health), the naïve estimation techniques such as the OLS method give biased results. In contrast, the GMM estimators could reduce this reverse causality bias given that the lagged values of remittances used as the instruments for

[75] The Anderson-Hsiao estimator (A-H) is another estimator that can be used to estimate this type of dynamic panel model. The A-H estimator specifies the original model in its first difference form and instruments the endogenous variables with their lagged values. Although the A-H estimator is simple to implement, the major concern is that the autocorrelation of the residuals in first difference is not taken into account and tested. This is why the dynamic panel GMM estimators (Arellano and Bond, 1991; Blundell and Bond, 1998) are useful since they resort to the generalized method of moments to estimate the parameters. This method dominates in efficiency the traditional 2SLS (the procedure used in the implementation of the A-H estimator) in the case of non-spherical perturbations (heteroskedasticity and autocorrelation of unknown forms). I tried to estimate all the models using the A-H estimator but I obtained unreliable results with no significant coefficients for all the explanatory variables.

remittances are not affected by the contemporaneous levels of public spending. However, one limitation often recognized in the dynamic panel GMM techniques is that the lagged values of the endogenous variables are sometimes poor instruments for the variables in first differences. If this holds, correcting the reverse causality bias through the use of the lagged values of the explanatory variables as instruments is misleading. This is why in this paper, the standard GMM estimator techniques are augmented by adding an "external instrument" that is suggested by the recent empirical literature on the macroeconomic determinants of remittances. The income per capita in the migrant host countries is therefore retained as the "external source of variation" for remittance inflows (see Section IV for a detailed discussion justifying the choice of this instrument).The addition of this external instrument should go some way towards vitiating the potential "weak instruments", simultaneity and reverse causality problems, that often arise in the context of traditional GMM estimations.

5.2.2. The variables

Two models are estimated according to the dependent variable used. We begin in each case with the model of public education spending. The exercise is repeated afterwards for public health spending.[76]

Data on public health spending and public education spending are taken from a dataset compiled by the Fiscal Affairs Department of the IMF (FAD).[77]

Following the empirical literature on the determinants of public spending on education and health in developing countries (Gbesemete and Gerdtham, 1992; Feyzioglu et al., 1998; Baqir, 2002; Okunade, 2005; Stasavage, 2005; Fosu, 2007, 2008; Docquier et al., 2008), the set of control variables includes:

[76] Baqir (2002) and Gomanee et al. (2005) also used these categories of public spending as proxies for pro-poor public expenditures.
[77] These data have been previously used by Baqir (2002) and Hauner and Kyobe (2010).

- GDP per capita in constant prices: this variable is included to control for the level of development among countries in the sample, but also to catch the elasticity of public spending with respect to income. Previous studies have found that public spending in social sectors is a normal good in developing countries (Okunade, 2005).

- Foreign aid: this variable catches the sensitivity of pro-poor government expenditure to external assistance from donors. This variable appeared to be positively related to government spending in previous studies (Gbesemete and Gerdtham, 1992; Gomanee et al., 2005; Fosu, 2007). Three variables of aid are used in this paper: aggregate aid, education aid and health aid, according to the dependent variable retained. Aggregate aid per capita series are drawn from the World Development Indicators while sectorial aid comes from the Country Reporting System (CRS) of the OECD.[78] The main advantage of the CRS is to provide data on aid commitments with a high degree of disaggregation by purpose (sector). Its main disadvantage though, is that the data are only reliable for recent years (since 1995). For sectorial data on aid, we always use aid commitments to each sector for education and health.[79] All series of aid are normalized by the country nominal GDP before taking them in logarithms.

- Debt service ratio: this variable is included to control for the effect of financial constraints at the government level on the amount of pro-poor (social) spending. As seen in previous works (Fosu, 2007, 2008), we expect a negative impact of this variable.

- Young population (age <14): this variable catches the demand for public subsidies in the education sector. We also control for this variable to drain off the possible impact of remittances on the demand for schooling. This is important to ensure that the effect of

[78] CRS database is available at:
http://www.oecd.org/document/0/0,2340,en_2649_34447_37679488_1_1_1_1,00.html
[79] The CRS also provides a disaggregation of disbursements by sector. Unfortunately disbursements are even more underreported than commitments.

remittances on government spending is not driven by the positive correlation between remittances and the demand for schooling, but only by the supply effects arising from public sector behavior.

- Total population growth rate: this variable measures the annual growth rate of the population in each country and would be positively correlated with public health spending. We also control for this variable to ensure that the effect of remittances is primarily due to supply effects emanating from the public health sector, rather than a demand effect for health services fueled by the positive correlation between remittances and fertility.[80]

- Inflation rate: We control for the inflation rate (the growth rate of the GDP deflator index) to assess the impact of overall macroeconomic instability on the composition of public social spending. We therefore expect the coefficient of this variable to be negative.

- Urbanization rate: this variable is introduced to capture the public preference in the geographical allocation of public funds for education and health to rural or urban areas.

- Remittances: data on remittances are drawn from the IMF Balance of Payments Yearbooks. The remittance variable is defined as current private transfers from migrant workers, who are residents of the host country, to recipients in their country of origin. We do not include the other components, such as compensation of employees or migrant transfers, which do not exactly represent remittances as a flow and as private decisions. Data are expressed in percentage of GDP before transforming into logarithm.

- Governance: This variable captures the inability of the government to implement policies for sustainable development.[81]

[80] The relationship between migration, remittances and the fertility of recipient households has been addressed by (Marchiori et al., 2008).

[81] Catrinescu et al. (2009) pointed out that 'good' institutions are viewed as establishing an incentive structure that reduces uncertainty and promotes efficiency – so contributing to stronger economic performance. The IMF

Following Abdih et al. (2008), we use the World Bank Governance Indicators dataset since this dataset has provided measures of governance for a large number of countries since 1996.[82] The Worldwide Governance Indicators (WGI) project has reported aggregate and individual governance indicators for 212 countries and territories since 1996. Six dimensions of governance are reported: voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, control of corruption.

More recently, the six indicators were defined as:

- *Voice and Accountability* – measuring the extent to which a country's citizens are able to participate in selecting their government; as well as freedom of expression, freedom of association, and a free media.

- *Political stability and Absence of Violence* – measuring perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including political violence or terrorism.

- *Government effectiveness* – measuring the quality of public services; the quality of the civil service and the degree of its independence from political pressures; the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.

(2003) recognizes that development-positive institutions are those that protect private property rights and the operation of the rule of law; lead to low levels of corruption; and facilitate all private interactions rather than protect a small elite. Overall, I assess that a country is vulnerable when its level of governance quality is low according to the measures of governance quality published in the empirical literature.

[82] Kaufmann, Kraay, and Mastruzzi (2009) construct a meta-indicator that aggregates a host of different measures, from firm, investor, and population surveys to expert and international organization assessments to come to their overall measurements of the quality of governance. Data are available at the Worldwide Governance Indicators (WGI) project website under the following address:
http://info.worldbank.org/governance/wgi/index.asp
For more details on the construction of the indices, refer to Kaufmann, Kraay and Mastruzzi (2009). "Governance Matters VIII: Aggregate and Individual Governance Indicators, 1996-2008". World Bank Policy Research Working Paper Series, 4978.

- *Regulatory quality* – measuring the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.

- *Rule of law* – measuring the extent to which Law Enforcement agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, the police and courts, as well as the likelihood of crime and violence.

- *Control of corruption* – measuring the extent to which public power is exercised for private gain (including both petty and grand forms of corruption), as well as "capture" of the state by elites and private interests.

It should be noted that these governance indicators are all based on data from expert assessments, polls of experts and surveys of government officials and businesses, and therefore capture perceptions of the government process rather than any formal aspects of the actual government structure in any given country. This creates the important problem that perceptions are shaped not just by the government environment, but also by many other aspects of the socio-economic environment, thereby creating its own set of endogeneity and reverse causality issues. There is a large literature critical of the World Governance Dataset (Arndt and Oman, 2006; Kurtz and Shrank, 2006; Kurtz and Shrank, 2007). Kaufmann, Kraay and Mastruzzi have categorized some of these critiques as concerns about the comparability of the indicators across countries and across time; concerns about bias in expert polls or in particular sources; and concerns about the independence of the different data sources and the consequences for the aggregate indicators. (Kaufmann, Kraay and Mastruzzi, 2006). More recently, Thomas (2010) dismisses the Worldwide Governance Indicators (WGI) as an 'elaborate and unsupported hypothesis' because of the failure to demonstrate the 'construct validity' of these indicators. A short answer to Thomas (2010) is provided by Kaufmann et al.

(2010). The authors cast doubts on the practical consequences of failure to meet the criteria of construct validity and therefore minimize this critique.

To build the indicators of governance used in the econometric estimations, we reverse all the original indicators of governance quality by the following formula:

$$G_{i,t} = \frac{\max(x_{i,t}) - x_{i,t}}{\max(x_{i,t}) - \min(x_{i,t})} \qquad (3)$$

where x is each indicator of governance quality. Min(x) and max(x) represent the minimum and the maximum of each indicator, respectively. This transformation ensures that $\boldsymbol{G}$ will have a range between 0 and 1. On this basis, $\boldsymbol{G}$ increases with the deterioration of the quality of governance. Moreover, equation (3) applied on each governance variable ensures the standardization of these variables into new indices which are therefore reasonably comparable. Given the fact that the indices are distributed over the same interval [0, 1], the coefficients of the interactive terms (remittances crossed with the governance variable) will allow direct comparison across the different equations. Descriptive statistics of all the variables and the list of countries in the sample are available in Table E1 and Table E3 in the appendix. The sample used covers a large number of developing countries (86 countries).

Next, we turn to the estimations of the econometric models. The panel data is unbalanced given missing values for some countries.

5.3. Results

5.3.1. Results for public education spending

The results of the estimations of Model 2 specified for the case of public education are presented in Tables 5.1 and 5.2. Table 5.1 presents the results using the difference-GMM estimator, whereas Table 5.2 shows the results derived from the estimator of the system-

GMM. In each table we present the diagnostic tests associated with these estimators, to be precise the test of autocorrelation of the residuals in first difference and the Hansen overidentification test. The estimations always pass the GMM specification tests. The residuals in first difference exhibit in each case a significant first order correlation, while the second order correlation is not significant. This validates the use of lagged values of explanatory variables as instruments. The Hansen overidentification tests do not reject the hypothesis that the instruments are not correlated with the residuals of the models.

In order to check the exogeneity of the instruments, we present the results of the difference-in-Hansen test which examines whether the instruments of the equation in level are exogenous in the system-GMM estimator (Roodman, 2009). Again, the results suggest that the instruments used in the system-GMM estimator are valid. Meanwhile, the number of lags of the endogenous variables has been limited to avoid the overfitting bias due to instrument proliferation (Roodman, 2009).

The public moral hazard problem induced by remittances would be validated if the interaction term of remittances crossed with the governance indicators is significantly negative once the additive terms of remittances and governance are controlled for. It appears that the interaction between remittance inflows and governance negatively affects the level of public spending on education. The results obtained by the difference-GMM method (Table 5.1) show that remittances are likely to reduce public education spending in countries suffering from governance problems (regarding the control of corruption, regulation, government effectiveness and accountability). We have not obtained a significant effect for the interaction of remittances crossed with the rule of law and political stability variables even if their coefficients show the expected negative sign.

When we turn on the system-GMM estimator, the results highlight a negative and significant coefficient of the interaction of remittances crossed with each of the six indicators of bad governance (Table 5.2). It also appears that a high level of government ineffectiveness and a low score on the variable rule of law are the most important sources of public moral hazard effects of remittances. The coefficients of the interactive terms with these variables exhibit the highest absolute values.

Regarding the control variables introduced, the results indicate that the only control variable that is consistently significant is the lagged dependent variable with a relatively high estimated coefficient close to 0.6 across the specifications. It is also worth noting that we have obtained higher values of the coefficient associated with the lagged dependent variable in the case of the system-GMM method compared to the values obtained from the standard difference-GMM (Table 5.1). These results have important implications in the context of GMM estimations. Indeed, given the strong inertia characterizing the dependent variable, there is an obvious "weak instrument" problem in the case of the difference-GMM estimator. This arises because the lagged values of the dependent variable used as instruments do not explain much of the sample variation in the first difference of the dependent variable.[83] In such a case, the difference-GMM estimate (Arellano and Bond, 1991) is asymptotically close to zero. In contrast, the system-GMM estimator which increases the set of the moment conditions by combining the equations in level with the ones in first difference helps reduce the bias of the difference-GMM estimator. This is why in this paper, the preferred results are clearly those obtained through the system-GMM estimator.

The results also highlight a positive and significant effect of the additive term of remittances in the models. Since the coefficient of this variable identifies the effect of remittances on

[83] This is also the case for the remittance variable which is recognized to have a strong inertia due to the high stability that the flow exhibits over the time.

government spending on education when the governance variable equals 0, this suggests that remittances increase the level of public expenditure in countries which do not suffer from governance problems. This result can be explained by the impact that remittances can exert on government indirect tax revenues, which help government to finance more public services.

5.3.2. Results for public health spending

The results are presented in Tables 5.3 and 5.4. All the diagnostic tests associated with the GMM methodology validate the estimation results. In Table 5.3, we present the results by using the Arellano-Bond estimator, and the system-GMM results are shown in Table 5.4. The difference-GMM results of Table 5.3 validate (in 5 cases out of 6) the hypothesis that remittance inflows reduce public health spending in countries experiencing governance problems.[84] The system-GMM results (Table 5.4) highlight a fiscal retrenchment in the health sector in 4 cases out of 6. The coefficient of the interactive term of remittances crossed with the governance indicators is not statistically significant in the case of corruption and regulatory quality, even though they exhibit the expected negative sign. In all the remaining cases, the hypothesis that remittances reduce strongly the allocation of public funds into the health sector is not rejected by the data. Again, the strongest impact is observed when the variable "Rule of law" is used (column 2).

Regarding the control variables, only the lagged dependent variable, the GDP per capita, and the additive term of remittances exhibit statistically significant coefficients in some specifications.

5.4. Robustness checks

We proceed in three steps to check the robustness of the previous results.

[84] The only case for which the coefficient of the interaction term is not significant is the specification using the regulatory quality.

5.4.1. Adding an external instrument for remittances

We estimate the models with an augmented system-GMM-IV estimator in which remittances, and remittances crossed with the indicators of governance, are instrumented by their lagged value and by an external instrument borrowed from the recent macro-econometric literature on remittances. Though we do not possess a sufficient number of excluded instruments for it to be possible to apply standard IV techniques, the addition of these external instruments should go some way towards vitiating the potential "weak instruments" problem that often arises in the context of traditional GMM estimation (Arcand et al., 2008). Two external instruments were added: the log-weighted GDP per capita for each of the migrant host countries, and this variable crossed with each indicator of governance quality (Aggarwal et al., 2011; Acosta et al., 2009).[85]

5.4.2. Testing for the existence of a common factor representation in the system-GMM-IV estimation

Consider again the model describing the effect of remittances on public spending conditional on the level of governance:

$$S_{i,t} = X'_{i,t}\,\beta + \theta_1 R_{i,t} + \theta_2 R_{i,t} * GV_{i,t} + \theta_3 GV_{i,t} + u_i + \varepsilon_{i,t} \qquad (4)$$

Suppose that the error term of the model is serially autocorrelated,

$$\varepsilon_{i,t} = \sigma\varepsilon_{i,t-1} + \upsilon_{i,t} \text{ with } |\sigma| < 1 \text{ and } \upsilon_{i,t} \sim \text{MA}(0) \qquad (5)$$

[85] We computed the GDP per capita in the migrants' host countries by weighting the GDP per capita of all other countries by the share that each of these countries represents in the emigration of workers of developing countries. The bilateral migration matrix used to make calculations was drawn from the World Bank web site: http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTDECPROSPECTS/0,,contentMDK:21154867~pagePK:64165401~piPK:64165026~theSitePK:476883,00.html

As noted by Blundell and Bond (2000) and Arcand et al. (2008), this type of model has a dynamic common factor representation which involves σ-differencing the model so as to obtain:

$$S_{i,t} = \sigma S_{i,t-1} + X'_{i,t}\beta + X'_{i,t-1}\sigma\beta + \theta_1 R_{i,t} + \sigma\theta_1 R_{i,t-1} + \theta_2 R_{i,t} * GV_{i,t} + \sigma\theta_2 R_{i,t-1} * GV_{i,t-1} +$$

$$\theta_3 GV_{i,t} + \sigma\theta_3 GV_{i,t-1} + (1-\sigma)u_i + \varepsilon_{i,t} - \sigma\varepsilon_{i,t-1} \qquad (6)$$

which can be rewritten as:

$$S_{i,t} = \sigma S_{i,t-1} + X'_{i,t}\pi_1 + X'_{i,t-1}\pi_2 + \pi_3 R_{i,t} + \pi_4 R_{i,t-1} + \pi_5 R_{i,t} * GV_{i,t} + \pi_6 R_{i,t-1} * GV_{i,t-1} +$$

$$\pi_7 GV_{i,t} + \pi_8 GV_{i,t-1} + \lambda^* u_i + \upsilon_{i,t} \qquad (7)$$

and where the common factor restrictions are given by:

$$\pi_l = -\sigma\pi_{l-1} \ (l = 2, 3 \ldots 8). \qquad (8)$$

Given consistent estimates of the unrestricted parameter vector π_l and $var(\pi_l)$, these restrictions can be tested and imposed using minimum distance to obtain the restricted parameter vector (β, θ, σ).

5.4.3. Aggregating all the dimensions of governance into a single index using the principal component analysis

We estimate the public spending models using an aggregate index of governance quality which combines all the 6 separate dimensions into a single index. The principal component analysis method is used to achieve this. The aggregate index of governance is the first principal component of the vector of the six indicators of governance already constructed. Table E2 in the appendix shows that the first principal component accounts for almost 75% of

the overall variance. The table also presents the eigenvectors and the correlation between the synthetic indicator and each of the variables.

5.4.4. Results of the robustness tests

In Table 5.5 (public education spending models) and 5.6 (public health spending models), we test the robustness of the results using the augmented system-GMM-IV in which we include the external instrument for remittances, and remittances crossed with the indicator of governance. We also test and impose the common factor representation in this system-GMM-IV. The results indicate that the set of the instruments used (the lagged internal instruments and the external instruments) are valid according to the *p*-values of the difference-in-Hansen tests, the second order autocorrelation tests of the residuals in first difference, and to the Hansen over-identification test p-values. Moreover, the test of the common factor restrictions suggests that the null hypothesis that these restrictions are valid cannot be rejected in all cases.

For the public education spending model (Table 5.5), all the coefficients of the interactive variables exhibit the expected negative signs and are statistically significant. These results confirm the hypothesis that remittance inflows are creating a public moral hazard problem in the public education sector for badly governed countries. The same results are obtained for the case of public health spending (Table 5.6). However, there remain two instances for which the coefficients of the interactive term are not statistically significant - Regulatory quality and Corruption). This result had already been demonstrated in Table 5.4.

In Table 5.7 and Table 5.8, we replace the separate indicators of governance by the composite index of governance derived from the principal component analysis.[86] In each of Tables 5.7 and 5.8, column 1 presents the results obtained by using only internal instruments (lagged

[86] The aggregate index is rescaled so that the variable is between 0 and 1.

value) while column 2 tests the robustness of the results by adding the two external instruments for remittances. Column 3 shows the results obtained by re-estimating the model as in column 2, but by imposing the common factor representation.

Whatever the specifications, the results highlight a negative and highly significant coefficient of the interactive term of remittances crossed with the composite governance index. Moreover, the range of the estimates of this coefficient is similar to what have been estimated in the previous tables.

We can therefore conclude that even when all the dimensions of governance are combined into a composite index, the finding that remittances reduce public spending on education and health in countries experiencing governance problems still remains, and is highly significant.

5.5. Concluding remarks

This chapter analyzed the effect of remittances on public policies in countries affected by governance problems. We tested the hypothesis that governments of badly governed countries tend to reduce the level of public spending in social sectors (education and health) when the level of remittances increases. More generally, we argued that remittances create a public moral hazard problem in those developing countries with governance problems. Using a large cross-section of developing countries (86 countries) observed over the recent period 1996-2007, and after factoring in the endogeneity of remittances, the potential effect of remittances on the demand for public services and the other sources of financing for the social sectors, the paper concludes that the remittance-induced fiscal retrenchment in social sectors takes place in developing countries with serious governance problems.

The paper has illustrated how remittances combined with bad public governance might induce a moral hazard problem both on government and households. Indeed, the negative effect of remittances on public spending on social sectors in institutionally vulnerable countries is the combination of two reinforcing effects: (*i*) public moral hazard - because the government has more incentive to reduce and divert resources, rather than providing subsidies since it thinks that remittances will do the "job". (*ii*) household moral hazard - because remittances mollify the recipient households which do not have the incentive to monitor the government and so leave the cost of insurance to the migrant.

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Table 5.1: Governance quality, remittances and public education spending, difference-GMM estimation results

	(1)	(2)	(3)	(4)	(5)	(6)
Remittances	0.145	0.060	0.062	0.105	-0.029	0.042
	(1.35)	(0.71)	(1.20)	(1.35)	(0.58)	(1.11)
Remittances*Corruption	-0.451*					
	(1.89)					
Remittances*Rule of law		-0.246				
		(1.23)				
Remittances*Regulatory quality			-0.415*			
			(1.68)			
Remittances*Government Effectiveness				-0.367*		
				(1.73)		
Remittances*Political stability					-0.081	
					(0.49)	
Remittances*Voice and accountability						-0.242**
						(2.61)
Corruption	-0.719					
	(0.68)					
Rule of law		-0.428				
		(0.26)				
Regulatory quality			-1.836			
			(1.33)			
Government Effectiveness				-0.214		
				(0.30)		
Political stability					-0.396	
					(0.44)	
Voice and accountability						-1.008
						(1.11)
Lag of the dependent variable	0.532**	0.509**	0.313	0.550**	0.398*	0.362
	(2.12)	(2.22)	(1.20)	(2.42)	(1.89)	(1.61)
Education aid	0.006	0.001	0.000	0.002	-0.000	-0.002
	(0.36)	(0.03)	(0.01)	(0.12)	(0.01)	(0.13)
GDP per capita	0.562	0.468	0.296	0.833	0.388	0.461
	(0.67)	(0.66)	(0.37)	(1.24)	(0.78)	(0.79)
Debt service	0.006	0.005	-0.029	0.015	-0.001	-0.000
	(0.21)	(0.17)	(0.78)	(0.52)	(0.06)	(0.02)
Population aged <14	0.779	0.902	0.507	1.628	0.757	0.807
	(0.44)	(0.58)	(0.29)	(1.13)	(0.67)	(0.64)
Inflation	-1.026	-0.713	-0.931	-0.856	-0.888	-0.812
	(1.15)	(0.91)	(1.14)	(1.09)	(1.02)	(1.15)
Urbanization	1.564*	1.462**	2.200*	1.319*	1.570**	1.417*
	(1.71)	(2.03)	(1.92)	(1.72)	(2.15)	(1.98)
Observations	433	437	439	439	439	439
Countries	77	78	78	78	78	78
Joint significance of coefficients of *Remittances*., *p*-value	0.124	0.349	0.240	0.224	0.434	0.038
m1:*p*-value	0.055	0.065	0.182	0.045	0.110	0.083
m2:*p*-value	0.467	0.521	0.543	0.700	0.383	0.478
Hansen OID test, *p*-value	0.707	0.269	0.288	0.457	0.125	0.201
Nb instruments	19	19	19	19	19	19

Note: Absolute robust *t* statistics in parentheses. The governance variables are reverted so that high values indicate a high level of bad governance. All the variables excepting the governance measures are expressed in natural logarithm form. m1 and m2 *p*-values refer to the Arellano and Bond (1991) test of autocorrelation of order 1 and 2 of residuals in first difference, respectively. The one-step difference-GMM is retained to estimate the coefficients. The unit of analysis is the country and the unit of observation is the year. Remittances and remittances crossed with the governance variables are treated as predetermined and therefore instrumented by their lagged values. Dependent variable: **log of public education spending-to-GDP**.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5.2 : Governance quality, remittances and public education spending, system-GMM estimation results

	(1)	(2)	(3)	(4)	(5)	(6)
Remittances	0.072	0.153*	0.063*	0.113	0.047*	0.086**
	(1.35)	(1.70)	(1.85)	(1.60)	(1.73)	(2.11)
Remittances*Corruption	-0.169*					
	(1.72)					
Remittances*Rule of law		-0.386**				
		(2.03)				
Remittances*Regulatory quality			-0.220**			
			(2.47)			
Remittances*Government Effectiveness				-0.306**		
				(2.05)		
Remittances*Political stability					-0.206**	
					(2.24)	
Remittances*Voice and accountability						-0.256***
						(2.65)
Corruption	-0.359					
	(1.58)					
Rule of law		-0.433				
		(1.19)				
Regulatory quality			-0.198			
			(0.95)			
Government Effectiveness				-0.532		
				(1.56)		
Political stability					-0.189	
					(0.92)	
Voice and accountability						-0.311
						(1.45)
Lag of the dependent variable	0.665***	0.643***	0.657***	0.683***	0.662***	0.645***
	(3.72)	(3.54)	(3.62)	(3.82)	(3.99)	(3.41)
Education aid	0.009	0.006	0.011	0.007	0.006	0.007
	(0.53)	(0.35)	(0.65)	(0.45)	(0.41)	(0.41)
GDP per capita	0.001	0.014	0.025	-0.012	0.030	0.005
	(0.03)	(0.32)	(0.51)	(0.32)	(0.67)	(0.12)
Debt service	0.002	-0.017	0.004	-0.009	0.006	-0.003
	(0.08)	(0.67)	(0.16)	(0.45)	(0.23)	(0.10)
Population aged <14	-0.012	-0.011	-0.002	-0.006	-0.033	-0.030
	(0.09)	(0.07)	(0.01)	(0.04)	(0.26)	(0.20)
Inflation	-0.715***	-0.761***	-0.624***	-0.671***	-0.595**	-0.677***
	(2.98)	(3.32)	(2.74)	(2.91)	(2.52)	(2.90)
Urbanization	0.014	0.009	0.000	0.028	-0.038	0.005
	(0.23)	(0.13)	(0.01)	(0.51)	(0.58)	(0.08)
Intercept	0.725	0.719	0.451	0.765	0.661	0.752
	(1.11)	(0.89)	(0.67)	(1.09)	(1.03)	(1.06)
Observations	537	541	543	543	543	543
Countries	80	80	80	80	80	80
Joint significance of coefficients of *Remittances*., *p*-value	0.143	0.070	0.033	0.035	0.084	0.030
m1:*p*-value	0.001	0.001	0.001	0.000	0.000	0.001
m2:*p*-value	0.644	0.660	0.670	0.717	0.719	0.724
Hansen OID test, *p*-value	0.736	0.595	0.610	0.624	0.536	0.535
Difference-in-Hansen test, *p*-value	0.832	0.366	0.937	0.541	0.539	0.292
Nb instruments	27	27	27	27	27	27

Note: Absolute robust *t* statistics in parentheses. The governance variables are reverted so that high values indicate a high level of bad governance. All the variables excepting the governance measures are expressed in natural logarithm form. m1 and m2 *p*-values refer to the Arellano and Bond (1991) test of autocorrelation of order 1 and 2 of residuals in first difference, respectively. The one-step system-GMM is retained to estimate the coefficients. Difference-in-Hansen test reports the *p*-values based on the null hypothesis that the instruments in the levels equation are exogenous. The unit of analysis is the country and the unit of observation is the year. Remittances and remittances crossed with the governance variables are treated as predetermined and therefore instrumented by their lagged values. Dependent variable: **log of public education spending-to-GDP**.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5.3: Governance quality, remittances and public health spending, difference-GMM estimation results

	(1)	(2)	(3)	(4)	(5)	(6)
Remittances	0.152*	0.113	0.022	0.109**	0.036	0.047
	(1.68)	(1.46)	(0.31)	(2.44)	(0.58)	(0.70)
Remittances*Corruption	-0.516**					
	(2.22)					
Remittances*Rule of law		-0.404*				
		(1.71)				
Remittances*Regulatory quality			-0.143			
			(0.40)			
Remittances*Government Effectiveness				-0.469**		
				(2.50)		
Remittances*Political stability					-0.354*	
					(1.78)	
Remittances*Voice and accountability						-0.392**
						(2.56)
Corruption	0.097					
	(0.08)					
Rule of law		-1.259				
		(0.65)				
Regulatory quality			0.680			
			(0.96)			
Government Effectiveness				-0.656		
				(0.49)		
Political stability					-1.040	
					(0.98)	
Voice and accountability						-0.117
						(0.07)
Lag dependent variable	0.682***	0.666***	0.396	0.623***	0.723***	0.535**
	(3.66)	(2.74)	(1.49)	(3.22)	(2.87)	(2.04)
Health aid	-0.005	0.005	0.000	0.006	-0.014	0.016
	(0.15)	(0.16)	(0.00)	(0.22)	(0.34)	(0.43)
Debt service	0.034	0.027	0.046	0.049	0.041	0.017
	(0.86)	(0.66)	(1.08)	(1.41)	(0.98)	(0.37)
GDP per capita	-0.440	-0.639	-0.052	-0.657	-0.514	-0.554
	(0.90)	(1.30)	(0.12)	(1.32)	(1.12)	(0.78)
Inflation rate	-0.597	-0.803	-0.482	-0.553	-0.515	-0.278
	(0.94)	(1.31)	(1.03)	(1.12)	(0.96)	(0.51)
Population growth	0.216**	0.176	0.080	0.150*	0.145	0.229
	(2.09)	(1.65)	(0.83)	(1.71)	(1.65)	(1.00)
Urbanization	0.769	0.976	0.682	1.051	1.506*	0.492
	(0.88)	(1.57)	(0.82)	(1.57)	(1.86)	(0.39)
Observations	464	467	469	469	467	469
Countries	83	84	85	85	85	85
Joint significance of coefficients of *Remittances*., *p*-value	0.084	0.231	0.922	0.032	0.189	0.035
m1:*p*-value	0.003	0.012	0.077	0.005	0.010	0.033
m2:*p*-value	0.308	0.293	0.325	0.222	0.247	0.313
Hansen OID test, *p*-value	0.810	0.616	0.283	0.658	0.520	0.594
Nb instruments	19	19	19	19	19	19

Note: Absolute robust *t* statistics in parentheses. The governance variables are reverted so that high values indicate a high level of bad governance. All the variables excepting the governance measures are expressed in natural logarithm form. m1 and m2 *p*-values refer to the Arellano and Bond (1991) test of autocorrelation of order 1 and 2 of residuals in first difference, respectively. The one-step difference-GMM is retained to estimate the coefficients. The unit of analysis is the country and the unit of observation is the year. Remittances and remittances crossed with the governance variables are treated as predetermined and therefore instrumented by their lagged values. Dependent variable: **log of public health spending-to-GDP**.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5.4 : Governance quality, remittances and public health spending, system-GMM estimation results

	(1)	(2)	(3)	(4)	(5)	(6)
Remittances	-0.001	0.148*	0.020	0.052	0.046	0.071**
	(0.01)	(1.84)	(0.59)	(1.36)	(1.51)	(2.07)
Remittances*Corruption	-0.057					
	(0.76)					
Remittances*Rule of law		-0.392**				
		(2.31)				
Remittances*Regulatory quality			-0.137			
			(1.59)			
Remittances*Government Effectiveness				-0.211**		
				(2.33)		
Remittances*Political stability					-0.222**	
					(2.38)	
Remittances*Voice and accountability						-0.252***
						(2.96)
Corruption	-0.218*					
	(1.81)					
Rule of law		-0.238				
		(0.96)				
Regulatory quality			-0.190			
			(0.97)			
Government Effectiveness				-0.244		
				(1.07)		
Political stability					-0.012	
					(0.07)	
Voice and accountability						-0.283
						(1.62)
Lag dependent variable	0.736***	0.754***	0.735***	0.741***	0.760***	0.728***
	(8.37)	(7.96)	(8.03)	(8.08)	(9.27)	(7.90)
Health aid	0.012	0.006	0.011	0.011	0.005	0.003
	(0.83)	(0.40)	(0.78)	(0.79)	(0.39)	(0.21)
Debt service	0.010	-0.021	0.005	-0.003	-0.002	-0.006
	(0.40)	(0.71)	(0.18)	(0.12)	(0.08)	(0.24)
GDP per capita	0.070*	0.055	0.076*	0.066	0.076**	0.049
	(1.76)	(1.36)	(1.75)	(1.58)	(2.26)	(1.23)
Inflation rate	-0.273	-0.558	-0.259	-0.347	-0.325	-0.452
	(0.78)	(1.34)	(0.76)	(0.93)	(0.85)	(1.14)
Population growth	-0.007	-0.011	-0.008	-0.011	-0.007	-0.005
	(0.35)	(0.47)	(0.40)	(0.54)	(0.37)	(0.25)
Urbanization	-0.000	0.040	0.001	0.014	-0.007	0.026
	(0.01)	(0.67)	(0.02)	(0.24)	(0.14)	(0.46)
Intercept	-0.115	-0.119	-0.204	-0.120	-0.250	-0.046
	(0.54)	(0.44)	(0.89)	(0.45)	(1.13)	(0.19)
Observations	578	581	583	583	580	583
Countries	86	86	86	86	86	86
Joint significance of coefficients of *Remittances*., *p*-value	0.173	0.034	0.105	0.029	0.053	0.012
m1:*p*-value	0.000	0.000	0.000	0.000	0.000	0.000
m2:*p*-value	0.275	0.304	0.221	0.234	0.257	0.208
Hansen OID test, *p*-value	0.173	0.222	0.156	0.109	0.164	0.312
Difference-in-Hansen test, *p*-value	0.070	0.081	0.073	0.015	0.034	0.129
Nb instruments	31	31	31	31	31	31

Note: Absolute robust *t* statistics in parentheses. The governance variables are reverted so that high values indicate a high level of bad governance. All the variables excepting the governance measures are expressed in natural logarithm form. m1 and m2 *p*-values refer to the Arellano and Bond (1991) test of autocorrelation of order 1 and 2 of residuals in first difference, respectively. The one-step system-GMM is retained to estimate the coefficients. Difference-in-Hansen test reports the *p*-values based on the null hypothesis that the instruments in the levels equation are exogenous. The unit of analysis is the country and the unit of observation is the year. Remittances and remittances crossed with the governance variables are treated as predetermined and therefore instrumented by their lagged values. Dependent variable: **log of public health spending-to-GDP**.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5.5 Governance quality, remittances and public education spending, system-GMM-IV with a Common Factor representation.

	(1)	(2)	(3)	(4)	(5)	(6)
Remittances	0.033	0.103**	0.045	0.095**	0.013	0.058*
	(0.94)	(1.97)	(0.709)	(2.51)	(0.45)	(1.83)
Remittances*Corruption	-0.136*					
	(1.67)					
Remittances*Rule of law		-0.359**				
		(2.55)				
Remittances*Regulatory quality			-0.245*			
			(1.64)			
Remittances*Government Effectiveness				-0.319***		
				(2.95)		
Remittances*Political stability					-0.211**	
					(2.04)	
Remittances*Voice and accountability						-0.228***
						(3.38)
Corruption	-0.081					
	(0.44)					
Rule of law		-0.097				
		(0.308)				
Regulatory quality			0.026			
			(0.08)			
Government Effectiveness				-0.258		
				(0.89)		
Political stability					0.345	
					(1.30)	
Voice and accountability						-0.013
						(0.05)
Lag of the dependent variable	0.954***	0.943***	0.942***	0.949***	0.953***	0.952***
	(87.97)	(93.70)	(75.78)	(109.13)	(84.62)	(88.71)
Observations	421	427	430	430	430	430
Countries	75	76	76	76	76	76
m1:*p*-value	0.013	0.013	0.002	0.016	0.009	0.005
m2:*p*-value	0.667	0.608	0.967	0.622	0.513	0.517
Hansen OID test, *p*-value	0.536	0.411	0.243	0.513	0.181	0.367
Difference-in-Hansen test, *p*-value	0.486	0.589	0.190	0.635	0.315	0.377
Comfac, *p*-value	**0.581**	**0.835**	**0.868**	**0.961**	**0.484**	**0.589**
Nb instruments	35	35	35	35	35	35

Note: Absolute robust *t* statistics in parentheses. Control variables are included in all the models but are not reported. Comfac is a minimum distance test of the non-linear common factor restrictions imposed in the restricted models. *P*-values are reported. Difference-in-Hansen test reports the *p*-values based on the null hypothesis that the instruments in the levels equation are exogenous. The governance variables are reverted so that high values indicate a high level of bad governance. All the variables excepting the governance measures are expressed in natural logarithm form. m1 and m2 *p*-values refer to the Arellano and Bond (1991) test of autocorrelation of order 1 and 2 of residuals in first difference, respectively. The one-step system-GMM is retained to estimate the coefficients. The unit of analysis is the country and the unit of observation is the year. Remittances and remittances crossed with the governance variables are treated as predetermined and therefore instrumented by their lagged values. The log of the GDP per capita in the host countries and this variable crossed with the indicators of governance are added in the instrument matrix. Dependent variable: **log of public education spending-to-GDP**.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5.6: Governance quality, remittances and public health spending, system-GMM-IV with a Common Factor representation.

	(1)	(2)	(3)	(4)	(5)	(6)
Remittances	0.022	0.057*	0.010	0.055***	0.008	0.047***
	(0.842)	(1.70)	(0.32)	(2.63)	(0.37)	(3.03)
Remittances*Corruption	-0.063					
	(1.03)					
Remittances*Rule of law		-0.178**				
		(1.96)				
Remittances*Regulatory quality			-0.093			
			(1.15)			
Remittances*Government Effectiveness				-0.187***		
				(2.94)		
Remittances*Political stability					-0.116**	
					(2.43)	
Remittances*Voice and accountability						-0.190***
						(3.77)
Corruption	-1.002***					
	(2.88)					
Rule of law		-1.137*				
		(1.88)				
Regulatory quality			0.048			
			(0.09)			
Government Effectiveness				-0.570		
				(1.30)		
Political stability					-0.272	
					(0.67)	
Voice and accountability						-0.822*
						(1.86)
Lag of the dependent variable	0.802***	0.749***	0.777***	0.739***	0.806***	0.735***
	(13.05)	(8.53)	(11.00)	(9.40)	(11.77)	(8.67)
Observations	532	538	539	539	537	539
Countries	81	82	82	82	82	82
m1:*p*-value	0.000	0.000	0.000	0.000	0.000	0.000
m2:*p*-value	0.699	0.446	0.351	0.320	0.402	0.289
Hansen OID test, *p*-value	0.615	0.602	0.633	0.296	0.576	0.634
Difference-in-Hansen test, *p*-value	0.812	0.741	0.768	0.265	0.843	0.472
Comfac, *p*-value	**0.983**	**0.965**	**0.976**	**0.984**	**0.917**	**0.975**
Nb instruments	41	41	41	41	41	41

Note: Absolute robust *t* statistics in parentheses. Control variables are included in all the models but are not reported. Comfac is a minimum distance test of the non-linear common factor restrictions imposed in the restricted models. P-values are reported. Difference-in-Hansen test reports the *p*-values based on the null hypothesis that the instruments in the levels equation are exogenous. The governance variables are reverted so that high values indicate a high level of bad governance. All the variables excepting the governance measures are expressed in natural logarithm form. m1 and m2 *p*-values refer to the Arellano and Bond (1991) test of autocorrelation of order 1 and 2 of residuals in first difference, respectively. The one-step system-GMM is retained to estimate the coefficients. The unit of analysis is the country and the unit of observation is the year. Remittances and remittances crossed with the governance variables are treated as predetermined and therefore instrumented by their lagged values. The log of the GDP per capita in the host countries and this variable crossed with the indicators of governance are added in the instrument matrix. Dependent variable: **log of public health spending-to-GDP**.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5.7: Governance quality, remittances and public education spending, Results using the principal component analysis of the governance indicators. (system-GMM estimator)

	(1)	(2)	(3)
Remittances	0.097	0.086	0.069
	(1.47)	(1.37)	(1.55)
Remittances*Governance quality	-0.294**	-0.275**	-0.298**
	(1.99)	(1.99)	(2.12)
Governance quality index (*composite index*)	-0.547	-0.560	0.204
	(1.56)	(1.53)	(0.51)
Lag of the dependent variable	0.675***	0.670***	0.950***
	(3.81)	(3.72)	(93.79)
Observations	537	526	421
Countries	80	78	75
m1:*p*-value	0.000	0.001	0.016
m2:*p*-value	0.807	0.760	0.448
Hansen OID test, *p*-value	0.694	0.691	0.295
Difference-in-Hansen test, *p*-value	0.705	0.485	0.248
Comfac test, *p*-value	..	..	0.575
Nb instruments	27	29	35

Note: Absolute robust *t* statistics in parentheses. Control variables are included in all the models but are not reported. The governance index is computed from a principal component analysis on the six dimensions of governance used before and is rescaled between 0 and 1. All the variables excepting the governance measure are expressed in natural logarithm form. m1 and m2 *p*-values refer to the Arellano and Bond (1991) test of autocorrelation of order 1 and 2 of residuals in first difference, respectively. The one-step system-GMM is retained to estimate the coefficients. Difference-in-Hansen test reports the *p*-values based on the null hypothesis that the instruments in the levels equation are exogenous. Comfac is a minimum distance test of the non-linear common factor restrictions imposed in the restricted models. *P*-values are reported. The unit of analysis is the country and the unit of observation is the year. Remittances and remittances crossed with the governance variable are treated as predetermined and therefore instrumented by their lagged values (Column 1) and we augment the instrument matrix with the log of GDP per capita in the host countries and with this variable crossed with the governance index (Column 2). In column (3), we estimate the model by imposing and testing for the common factor representation. Dependent variable: **log of public education spending-to-GDP**. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5.8: Governance quality, remittances and public health spending, Results using the principal component analysis of the governance indicators (system-GMM estimator).

	(1)	(2)	(3)
Remittances	0.078	0.055	0.037**
	(1.64)	(1.31)	(2.14)
Remittances*Governance quality	-0.271**	-0.226**	-0.162**
	(2.47)	(2.12)	(2.49)
Governance quality index (*composite index*)	-0.368	-0.373	-1.450**
	(1.45)	(1.44)	(2.18)
Lag dependent variable	0.745***	0.756***	0. 783***
	(8.19)	(8.45)	(9.36)
Observations	575	565	530
Countries	86	83	81
m1:*p*-value	0.000	0.000	0.000
m2:*p*-value	0.239	0.241	0.315
Hansen OID test, *p*-value	0.210	0.285	0.666
Difference-in-Hansen test, *p*-value	0.043	0.056	0.522
Comfac test, *p*-value	..	..	0.946
Nb instruments	31	33	41

Note: Absolute robust *t* statistics in parentheses. Control variables are included in all the models but are not reported. The governance quality index is computed from a principal component analysis on the six dimensions of governance used before and is rescaled between 0 and 1. All the variables excepting the governance measure are expressed in natural logarithm form. m1 and m2 *p*-values refer to the Arellano and Bond (1991) test of autocorrelation of order 1 and 2 of residuals in first difference, respectively. The one-step system-GMM is retained to estimate the coefficients. Difference-in-Hansen test reports the *p*-values based on the null hypothesis that the instruments in the levels equation are exogenous. Comfac is a minimum distance test of the non-linear common factor restrictions imposed in the restricted models. *P*-values are reported. The unit of analysis is the country and the unit of observation is the year. Remittances and remittances crossed with the governance variable are treated as predetermined and therefore instrumented by their lagged values (Column 1) and we augment the instrument matrix with the log of GDP per capita in the host countries and with this variable crossed with the governance index (Column 2). In column (3), we estimate the model by imposing and testing for the common factor representation. Dependent variable: **log of public health spending-to-GDP**. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Appendix E

Table E1: Descriptive statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
Governance measures					
Corruption	1664	0.58	0.17	0	1
Rule of law	1692	0.51	0.15	0	1
Regulatory quality	1716	0.43	0.16	0	1
Government Effectiveness	1716	0.48	0.16	0	1
Political stability	1684	0.40	0.19	0	1
Voice and accountability	1730	0.49	0.22	0	1
Composite index	1636	0.47	0.16	0	1
GDP per capita (log)	1688	6.94	1.09	4.19	9.20
Education aid (% GDP) (log)	1572	-1.60	1.94	-10.32	2.91
Health aid (% GDP) (log)	1519	-1.91	2.39	-11.54	2.73
Debt service (% GDP) (log)	1524	1.24	0.94	-2.94	4.91
Population aged <14 (%) (log)	1703	3.54	0.28	2.60	3.91
Population growth rate (%)	1795	1.59	1.25	-10.96	9.09
log (100+Inflation rate)	1709	0.10	0.20	-0.27	4.01
Urbanization rate (log)	1783	3.73	0.51	2.00	4.54
Public education spending (% GDP) (log)	1065	1.33	0.54	-1.29	3.14
Public health spending (%GDP) (log)	1143	0.63	0.70	-1.76	2.76
Remittances (% GDP) (log)	1113	0.35	2.07	-10.19	3.90

Table E2: Aggregating governance variables: principal components analysis (*first eigenvector, correlation*)

Variables	Governance quality, Composite index
Control of corruption	0.423
	(0.899)
Rule of law	0.437
	(0.930)
Regulatory quality	0.405
	(0.860)
Government effectiveness	0.430
	(0.913)
Political stability	0.363
	(0.771)
Voice and Accountability	0.386
	(0.821)
Eigenvalue	4.52
Variance proportion	75.3%

Note: We report the first eigenvector resulting from the first principal component analysis of governance quality. The aggregate index of governance is obtained using the following formula: GV = 0.423*K1 + 0.437*K2 + 0.405*K3 + 0.430*K4 + 0.363*K5 + 0.386*K6, where K1, K2, K3, K4, K5, and K6 represent *standardized* measures of Control of corruption, Rule of law, Regulatory quality, Government effectiveness, Political stability, and Political stability, respectively. In addition, the numbers in parentheses (below the different eigenvectors) represent the correlation of the first principal component with the corresponding governance variable. The governance quality variables have been rescaled so that high values indicate high level of bad governance.

Table E3: List of countries in the sample (86)

Albania	Dominica	Kenya	Papua New Guinea	Ukraine
Argentina	Dominican Rep.	Kyrgyz Rep.	Paraguay	Uruguay
Armenia	Ecuador	Lebanon	Peru	Vanuatu
Azerbaijan	Egypt	Lesotho	Philippines	Venezuela
Bangladesh	El Salvador	Liberia	Senegal	Yemen, Rep.
Belize	Ethiopia	Madagascar	Seychelles	Zambia
Benin	Fiji	Malawi	Sierra Leone	
Bolivia	Gabon	Mali	Sri Lanka	
Bosnia and Herzegovina	Gambia	Mauritania	St. Kitts and Nevis	
Botswana	Georgia	Mexico	St. Lucia	
Brazil	Ghana	Moldova	St. Vincent and the Grenadines	
Burkina Faso	Grenada	Mongolia	Sudan	
Burundi	Guatemala	Morocco	Swaziland	
Cambodia	Guinea	Mozambique	Tajikistan	
Cameroon	Guinea-Bissau	Nepal	Tanzania	
Cape Verde	Honduras	Nicaragua	Togo	
Colombia	India	Niger	Tonga	
Costa Rica	Jamaica	Nigeria	Tunisia	
Cote d'Ivoire	Jordan	Pakistan	Turkey	
Djibouti	Kazakhstan	Panama	Uganda	

Chapter 6. Remittances, value added tax and tax revenues

6.1. Introduction

One of the most important issues faced by developing countries and which is raised even more seriously today is finding ways to improve the internal mobilization of domestic resources in order to finance public goods. In a context of degradation of public finances in the developed world, the high dependency of developing countries on external development assistance should be addressed and reversed by acting on the ways to efficiently increase the mobilization of domestic resources. In this vein, looking at the ways to improve the mobilization of domestic resources and to build fiscal space in these countries is therefore crucial for the sustainability of public finances and for economic development in general.

If the trend is a stagnation of foreign aid and other forms of development assistance to developing countries, it is worth noting that, at the same time, developing countries receive large amounts of external private transfers, namely migrant remittances. Remittances constitute a bulk of resources received by developing countries and some scholars argue they represent an external and stable source of funding for development (Ratha, 2005). To put some numbers in mind, the level of remittances has attained 338 billions of US dollars in 2008. And despite the recent world wide crisis, remittances have shown a stronger comparative resilience than the other types of financial flows received by developing countries. Moreover, for a number of countries, remittances represent the most important source of external funding, going beyond the levels of foreign aid or foreign direct investment (Ratha, 2009).

A number of studies has analyzed the macroeconomic impact of remittances in terms of growth, poverty, competitiveness and macroeconomic instability in receiving countries. The result showing that remittances significantly reduce poverty rates is largely accepted among scholars (Adams, 2005; Gupta *et al*., 2009). However, the role played by remittances in

enhancing economic growth is still an open debate. If the direct and linear contribution of remittances to economic growth seems difficult to conclude (Chami *et al*., 2009b), their positive effect on economic growth conditioned upon some factors (the quality of governance and the financial development) is now recognized (Catrinescu *et al*., 2009; Giuliano and Ruiz-Arranz, 2009; Singh *et al*., 2009). On average, remittances also contribute towards reducing the volatility of output and consumption in the receiving countries (Chami *et al*., 2009a; Craigwell et al., 2010). However, these beneficial macroeconomic effects have a price. Remittances can appreciate the real exchange rate in countries and therefore reduce their external competitiveness (Amuedo-Dorantes and Pozo, 2004; Acosta *et al*., 2009).

In this macroeconomic literature on remittances, little is said about their consequences on public policy. Two recent papers, however, have questioned the implications of remittance inflows in terms of the sustainability of public finances and economic policy management. Abdih *et al*. (2009) investigated the impact of remittances on the sustainability of government debt using Lebanese fiscal data. Their main result is that the inclusion of remittances in the traditional analysis of the sustainability of the debt alters the amount of fiscal adjustment required to place debt on a sustainable path. They argue that one of the ways remittances can affect fiscal sustainability is the increase of the tax base. Even if they are not taxed directly, remittance flows may indirectly increase the revenue that the government receives from consumption-based and trade-based taxation since they contribute to a higher consumption of domestic and imported goods. This idea has been empirically confirmed by Abdih *et al*. (2010) using panel data for countries in the Middle East, North Africa and Central Asia.

Another paper on the link between remittances and public finances is Chami *et al*. (2008). Using a dynamic general equilibrium model calibrated to match the characteristics of Chilean economy, they showed that the use of a tax on labor income has the undesirable effect of making the government rely more on inflation to appropriate resources as the level of

remittances increases. This happens because remittances decrease the labor supply and consequently the labor tax base. In contrast, when the government uses consumption taxation, an increase in remittances leads to an increase in tax revenues through private consumption and the government policy is relatively less distortionary.

The main conclusions of these three recent papers are twofold. Firstly, migrants' remittances might increase the government tax revenue even if they are not directly taxed by the government. Secondly, since remittances enter the receiving economy through familial transfers they indirectly affect fiscal policy and the debt sustainability through the activities of remittance-receiving households, primarily through their consumption and saving decisions. Abdih *et al*. (2009) stressed that it is in this respect that remittances are different from natural resources, which governments may own and from which they derive revenue, from foreign and domestic public aid, which directly enter the government budget constraint, and from private capital flows that enter directly into the production process.

This paper extends the previous analyses to the whole sample of developing countries. It investigates the contribution of remittances to both the level and the stability of government tax revenue. Since the effects of remittances on tax revenue are essentially indirect (through consumption), this paper therefore examines the role of a value added tax system in the relationship between remittances and total tax revenue ratio.

Two main hypotheses are tested. (i) Without taxing remittances directly, government can enjoy more tax revenue ratios through the VAT system since remittances are largely used for consumption purposes and since the main tax base for VAT is consumption. (ii) Given the positive contribution of remittances to output and private consumption smoothing (Chami *et al*. 2009a; Craigwell et al., 2010; Bugamelli and Paternò, 2011), countries that have adopted a VAT will enjoy less volatile tax revenue ratios thanks to remittance inflows.

This paper raises at least two important debates. Firstly, it explores a new way through which the adoption of a VAT could enhance the level of tax revenue. A recent paper has shown the positive contribution of the VAT to the domestic resource mobilization and its main conclusion is that the VAT is more efficient for tax revenue mobilization the more opened the economy is (Keen and Lockwood, 2010). By looking at another aspect of globalization with remittances, our study complements earlier papers. Secondly, the study examines whether the presence of a VAT is also stabilizing to the extent that it enhances the stabilizing contribution of remittances to the tax revenue ratio. This question seems important to investigate since previous studies have highlighted that the volatility of government tax revenue is quite large for developing countries (Brun *et al*., 2006) and leads to an instability of government spending (Lim, 1983; Bleaney *et al*., 1995; Ebeke and Ehrhart, 2011). To our knowledge, this study is the first one that combines remittances and the VAT-based taxation system to analyze both the dynamic of the level and the volatility of government revenue in the developing world.

To test the two formulated hypotheses, a large sample of developing countries and panel estimators are retained. Whatever the estimator (OLS with fixed effects, Least Squares Dummy Variables Corrected estimator, Difference-GMM estimator and System-GMM estimator), the results do not reject the hypothesis that remittances increase both the level and the stability of government tax revenue in presence of a VAT. These results are also robust to an alternative definition of workers' remittances.

The rest of the chapter is organized as follows. Section 2 presents the econometric models of the relationship between remittances, the level and the volatility of the tax revenue ratio. The section also discusses the data that are used and the identification strategy. Section 3 presents and discusses the results and the robustness checks that are conducted. Section 4 concludes on policy implications.

6.2. Empirical analysis

This section presents the specified econometric models, the methodology that is implemented and the data that are used.

6.2.1. Tax revenue ratio equation

The econometric model

The econometric model of the determinants of the tax revenue ratio is similar to previous studies for the choice of control variables (Gupta, 2007; Mahdavi, 2008 and Keen and Lockwood, 2010). We add two terms to the traditional model: remittances and remittances interacted with a dummy variable for the VAT. More precisely, the specification takes the following form:

$$ty_{i,t} = \alpha + X'_{i,t}\beta + \theta_1 R_{i,t} + \theta_2 R_{i,t} * V_{i,t} + \lambda V_{i,t} + \mu_i + \eta_t + \varepsilon_{i,t} \qquad (1)$$

where $ty_{i,t}$ is the total tax revenue ratio excluding grants (divided by country GDP), R is the remittance ratio (in percentage of GDP) and V a dummy variable which takes the value 1 if there is a VAT in each country i for each year t and 0 otherwise. μ_i, η_t and $\varepsilon_{i,t}$ are the country-specific effect, time-specific effect and the error term, respectively. **X** is the set of control variables. We control for the share of agriculture in GDP that is expected to be negatively correlated with the revenue ratio. It may also serve as a broad indicator of informality and economic development. Openness (measured as the sum of the GDP shares of imports and exports) is also a candidate: Rodrik (1998), for example, finds openness to be positively related to the size of government.[87] We also allow demographic variables–the proportions of the population aged 14 or younger and 65 or over – to play a potential role.

[87] Given the importance to the VAT of collection at border points, one might also expect this variable to influence the VAT adoption decision and therefore reduces the selection bias behind the VAT adoption.

These variables may affect the need for the tax revenue to support those out of the labor market. Finally, we control for macroeconomic instability via the inflation rate (measured as the growth rate of the GDP deflator).

In equation (1), the hypothesis tested is that $\theta_1 \leq 0$ and $\theta_2 > 0$ so that the impact of remittances in presence of a VAT ($\theta_1 + \theta_2$) is positive while the impact of remittances on tax revenue ratio in absence of a VAT (θ_1) is negative or null.[88]

Equation (1) is firstly estimated by ordinarily least squares with country and time fixed-effects (OLS-FE). However, this method has important shortcomings in our context. It does not allow to take into account the dynamic properties of the dependent variable (the tax rate) nor does it deal with the endogeneity of some regressors.[89] The endogeneity of remittances is of concern here given that altruistic migrants can send more remittances in order to maintain the purchasing power of their family in their country of origin, especially when the tax burden is too high and reduces the disposal income. The endogeneity of remittances can also arise in the case of omitted variables. For example, the emigration of individuals can directly reduce the labor tax base and therefore total tax revenues, and at the same time, it determines the amount of remittance inflows.

The endogeneity of the VAT adoption is due to the main motivation behind this reform. Countries choose to adopt a VAT in order to increase the efficiency of the revenue mobilization. Therefore, the VAT adoption is highly predetermined.

To deal with these important issues, we proceed in two steps. Firstly, we adopt a dynamic panel specification of the equation (1). By introducing the lagged value of the tax revenue

[88] The impact of remittances in a context of no VAT is supposed to be negative or null since remittances can reduce labor force participation and therefore reduce the revenue collected from direct taxes (Chami *et al.*, 2008).

[89] Indeed, the tax revenue ratio seems strongly autoregressive year by year given the slow dynamic of changes in the official tax rates in countries.

ratio, we both control for the inertia of the dependent variable and expect reducing the self-selection bias in the VAT adoption. The equation takes the following form:

$$ty_{i,t} = \alpha + \rho ty_{i,t-1} + X'_{i,t}\beta + \theta_1 R_{i,t} + \theta_2 R_{i,t} * V_{i,t} + \lambda V_{i,t} + \mu_i + \eta_t + \varepsilon_{i,t} \quad (2)$$

Given that the OLS-FE estimator is biased due to the presence of both the lagged dependent variable and the country fixed-effects, we use the Least Squares Dummy Variables Corrected estimator (LSDVCE) a method recently proposed by Kiviet (1995), Judson and Owen (1999), Bun and Kiviet (2003), and extended by Bruno (2005), to unbalanced panels such as the one used in this study. This method corrects the bias associated with dynamic panel data model with fixed-effects. The procedure has to be initialized by a consistent estimator to make the correction feasible, since the bias approximation depends on the unknown population parameters. In this study, we initialize the bias correction with the OLS-FE estimator. However, the main drawback is that the estimated asymptotic standard errors may provide poor approximations in small samples, possibly generating unreliable *t*-statistics. The statistical significance of the LSDVCE coefficients is therefore tested using bootstrapped standard errors (with 100 replications).

The second strategy that we adopt to test the robustness of our results is to control for both the dynamic properties of the tax revenue ratio and the endogeneity of the regressors. Hence an econometric strategy based on instrumental variables must be implemented. Equation (2) in level and equation (2) in first differences are combined in a system and estimated with an extended GMM estimator system which allows the use of lagged differences and lagged levels of the explanatory variables (remittance terms and VAT dummy) as instruments (Blundell and Bond, 1998).[90]

[90] The paper uses the System-GMM estimator developed by Blundell and Bond (1998) for dynamic panel data with the Windmeijer (2005) correction for finite sample bias.

In order to improve the quality of the instrumentation of the VAT dummy, we augment standard GMM estimation techniques by adding an external instrument for the VAT dummy: for each country, the external instrument is the lagged share of geographical neighbors that have already adopted the VAT for each year *t*.[91] The lagged value of this variable is used instead of its current value because imitation and neighborhood effects take time. This variable is also interacted with the lagged values of remittance ratio to instrument the interactive term of remittances crossed with the VAT dummy.

For robustness checks, we also conduct estimations using the difference-GMM estimator (Arellano and Bond, 1991). In this context, equation (2) is firstly differentiated to eliminate the fixed-effects and the first-differentiated variables are instrumented by the lagged value of these variables in level. However, our preferred results are derived from the System-GMM estimator which is asymptotically more efficient in small samples.

Data

Tax revenue data are drawn from the IMF Government Financial Statistics database and from several IMF article IV reports. Data exclude grants and are expressed at the General Government level.

We follow the World Bank in defining remittances as the sum of workers' remittances and employees' compensation(s). Workers' remittances properly refer to current transfers by migrants who are employed and reside in the countries where they migrated (destination country); employees' compensation should comprise wages, salaries and other benefits earned by individuals in countries different from their resident country (country of origin) and for work performed for and paid by residents of the destination countries. We use the sum of

[91] Keen and Lockwood (2010) used a similar variable as an important determinant of the VAT adoption. They also showed that the lagged value of tax revenue ratio significantly and negatively determines the adoption of the VAT. Thus, by controlling in equation (2) for the lagged value of the tax revenue ratio, we reduce the endogeneity of the VAT adoption.

these two items because for many developing countries the statistical distinction between the two could be highly problematic (Bugamelli and Paternò, 2011). However, in order to check the robustness of the results in sub-section 3.3, we test an alternative measure of remittances by using the narrower definition (only workers' remittances).

VAT dummy is constructed according to the information on the dates of the adoption of the VAT that are provided by Ebrill *et al*. (2001) and updated. All the data for the remaining control variables are drawn from World Development Indicators.

6.2.2. Tax revenue instability equation

Econometric model

The econometric model of the determinants of the instability of tax revenue ratio is similar to previous studies for the choice of control variables (Lim, 1983; Bleaney *et al*., 1995 and Ebeke and Ehrhart, 2011). We add two terms to the traditional models: remittances and remittances interacted with a dummy variable for the presence of a VAT. More precisely, the specification takes the following form:

$$\sigma_{i,\tau} = \alpha + \phi\sigma_{i,\tau-1} + X'_{i,\tau}\beta + \gamma_1 R_{i,\tau} + \gamma_2 R_{i,\tau} * V_{i,\tau} + \theta V_{i,\tau} + \mu_i + \eta_\tau + \varepsilon_{i,t} \qquad (3)$$

where $\sigma_{i,\tau}$ is the standard deviation of the growth rate of the total tax revenue ratio (excluding grants) over the sub-period τ. *R* is the remittance ratio (in percentage of GDP) and *V* a dummy variable which takes the value 1 if there is a VAT in each country *i* for at least 3 years in a sub-period τ. μ_i, η_τ and $\varepsilon_{i,\tau}$ are the country-specific effect, time-specific effect and the error term, respectively. *X* is the set of control variables, which includes the standard determinants of macroeconomic volatility such as trade openness and the standard deviation of the inflation growth rate (inflation volatility). The hypothesis tested is $\gamma_2 < 0$ and

$(\gamma_1 + \gamma_2) < 0$ so that the impact of remittances on the instability of tax revenue is more negative in the presence of a VAT than without a VAT (γ_1).

We do not control additively for the volatility of the GDP per capita nor for the volatility of household consumption because they represent the main channels for remittances to stabilize the tax revenue ratio. However, to test the fact that the stabilization of private consumption represents the channel for remittances to stabilize the tax revenue ratio in a country that has adopted a VAT, we add to equation (3) the standard deviation of household consumption per capita growth rate. If this channel works, we would get a reduction in the magnitude (in absolute value) and in the significance of the coefficient of the interaction of remittances crossed with the VAT dummy.

The time period of this panel consists of non-overlapping sub-periods of 5 years defined as follows: 1980/1984, 1985/1989… 2000/2005. The variables defined as standard deviation are computed over each of these sub-periods while the other remaining variables are defined in terms of sub-period averages.

The dynamic specification is retained to catch the inertia of the instability of government tax revenue in developing countries. OLS-FE applied to equation (3) leads to biased estimates and we therefore retain the system-GMM estimator.

Endogeneity issues are still of concern here. Regarding remittances, the endogeneity can be explained by the fact that they tend to increase in case of negative shocks that generate macroeconomic instability and therefore government revenue instability. Regarding the VAT, if governments choose this taxation system in order to improve the stability of their tax revenues, there is therefore a self-selection bias. By controlling for the lagged value of tax revenue instability, we partially reduce this bias. However, we will follow the same identification strategy built in the system-GMM framework by instrumenting remittances and

the VAT dummy by their lagged values and the share of geographical neighbors with a VAT, respectively. The interactive term of remittances crossed with the VAT dummy is instrumented by the product of lagged values of remittances and the share of geographical neighbors that have adopted the VAT.

Except for the tax revenue data, all the other variables used in equation (3) are drawn from the World Bank Tables. Descriptive statistics of all the variables and the list of countries included in the sample are reported in the appendix.

6.3. Estimation results

The first set of results concerns the impact of remittances on the level of tax revenue ratio. The second set of results describes the contribution of remittances to the stabilization of government tax revenue ratio.

6.3.1. Remittances, VAT and the tax revenue ratio

Table 6.1 presents the estimations of the impact of remittances on the tax revenue ratio. For each estimator used, the Table informs about the linear impact of remittances and, in every second column, about the impact conditional on the presence of the VAT.

Whatever the estimator used, the results indicate that, on average, remittances do not have a significant impact on the tax revenue ratio. This can be explained by two effects: on the one hand, remittances may increase tax revenue by expanding the private demand (consumption of tradable or non-tradable goods, domestic investment). On the other hand, remittances could reduce the labor supply and increase leisure time at home (Chami *et al*., 2005). It results a contraction of the domestic production and therefore in a sharp decrease in tax revenue ratios for countries that exclusively depend on corporate and individual taxes (Chami *et al*., 2008) but not on VAT.

The story changes when remittances are interacted with the VAT dummy. Whatever the estimator used, the interactive term of remittances is statistically significant and exhibits a positive sign. It is important to keep in mind that the coefficient of the additive term of remittances identifies the impact of remittances in countries without a VAT. The sum of the two coefficients associated with remittances gives the impact for countries that have a VAT system. It emerges that the contribution of remittances in countries without a VAT is never statistically significant. This is consistent with the previous papers already quoted. In contrast, remittances seem to significantly increase the tax revenue ratio when countries have implemented a VAT system.[92]

When we turn to our preferred estimations by the system-GMM method (columns [1.7] and [1.8]), the results indicate that the impact of remittances in country with a VAT stands at 0.08. Perhaps a better sense of the quantitative significance of this coefficient can be obtained from the following calculation. The median share of the remittance ratio in our sample is around 1.8 %GDP. A shift from the median toward the 75th percentile of the distribution of the remittance ratio (an increase from 1.8 to 5.3 %GDP) which corresponds to a variation of 3.5 percentage points of GDP would lead to an increase in the total tax revenue ratio by 0.3 %GDP in a country that has a VAT system.

6.3.2. Remittances, VAT and the instability of the tax revenue ratio

Table 6.2 presents the estimation of the impact of remittances on the instability of the tax revenue ratio. The estimator used is the system-GMM since remittances are taken as endogenous and the instability of tax revenue appears strongly autoregressive in the sample. Column [2.1] reports the linear (unconditional) impact of remittances on the instability of the

[92] Table 6.1. reports the sum of the two coefficients associated with remittances and this sum is always positive and statistically significant in the case of OLS-FE, LSDVC and System-GMM results.

tax revenue ratio. The results indicate a non significant stabilizing effect of remittance inflows.

In column [2.2], the VAT dummy is introduced additively and in interaction with the remittance ratio. Three important results emerge. Firstly, the presence of a VAT appears stabilizing. Countries that have adopted a VAT (and whatever their characteristics, such as openness, the level of development, governance quality or remittance levels), enjoy more stable tax revenue than the others. This result complements early studies on the fiscal impact of the VAT adoption. For instance, Keen and Lockwood (2010) showed that the VAT adoption is a factor enhancing the efficiency of the tax revenue collection.[93] Our results indicate that the VAT is not only a determinant of the level of the tax revenue ratio, but also a tax revenue stabilizer. Since the VAT is based on a macroeconomic aggregate (consumption) that is relatively more stable, countries that rely on this tax instrument would have less volatile tax revenue. This result posits the VAT as an effective determinant of overall fiscal performance (measured as the level of mobilization of revenue and the stability of these revenues) in developing countries.

Secondly, the additive term of remittances which measures the impact of these flows on the instability of tax revenue in countries without a VAT system, appears not to be statistically significant although it is negative. This is in line with our expectations. Indeed, if remittances stabilize private consumption over time, countries that do not tax consumption via a VAT system would not take advantage of the stabilizing effects of remittance inflows on private consumption.

Thirdly, the results of column [2.2] indicate a stabilizing effect of remittances on tax revenue in countries with a VAT. The impact is negative (the sum of the two remittances coefficients)

[93] More precisely, they showed that the positive effect of the VAT on the tax revenue is conditional on the degree of trade openness and the level of economic development.

and stands around -0.28.[94] In column [2.3], we test whether this stabilizing contribution of remittances passes through the stabilization of private consumption. Hence, the model includes the instability of the household consumption per capita growth. As expected, its effect on the tax revenue instability is strongly positive and significant. The inclusion of this variable, however, deteriorates the significance of the remittance coefficients. This confirms our guess that one of the main channels through which remittances could stabilize government tax revenue in countries with a VAT system is through their consumption smoothing properties.

6.3.3. Robustness checks

One of the main difficulties that arise in the macroeconometric works on remittances is the measurement error in the remittance variable. Remittances data are essentially underreported for many countries due to the existence of informal channels. Another concern is the fact that many empirical papers that used World Bank data define remittances as the sum of workers' remittances and employees' compensations. The main justification is that, for many countries, the distinction between workers' remittances and employees' compensations is difficult to make. Nevertheless, we test the robustness of all the previous results, with an alternative definition of remittances by only using the narrower definition. We define remittances in this section as current transfers by migrants who are employed and resident in the countries where they migrated (destination country). Data are drawn from the IMF Balance of Payments Yearbook (various editions). As previously, remittance values are normalized by country GDP.

Table 6.3 reports the results of the impact of remittances on the tax revenue ratio. The results appear broadly the same than those of Table 6.1. When remittances are included additively,

[94] In Table 6.2, the results of the Wald-test of the joint significance of the two remittance coefficients indicate a significant effect at almost 5%.

and whatever the estimator (OLS-FE, GMM), they do not exhibit a significant coefficient. In contrast, the conditional effect of remittances on the tax revenue ratio is statistically significant. Indeed, the interaction term of remittances is positive and significant, and this result confirms the proposition that remittances tend to significantly increase the tax revenue ratios in countries that have already adopted a VAT system. The contribution of remittances in countries with a VAT stands around 0.05 (column [3.6] in the case of system-GMM estimations).

Table 6.4 reports the results of the impact of remittances on the instability of the tax revenue ratio. The results remain qualitatively the same as those of Table 6.2. The inclusion of remittances additively doesn't lead to any stabilizing effect (column [4.1]). However, when the model enables to include the interactive term of remittances crossed with the VAT dummy, the stabilizing contribution of remittances is observed. The value of the coefficient of remittances for countries that have adopted the VAT (the sum of the two remittance coefficients) stands at – 0.38 (column [4.2]), a value close to that of Table 6.2 (– 0.28). In column [4.3], the inclusion of the instability of consumption per capita leads to a deterioration of the significance of the coefficients of interest. The consumption smoothing channel is then empirically confirmed by the data.

6.4. Concluding remarks

This chapter showed robustly that remittances can increase both the level and the stability of government tax revenue in receiving countries. However, these positive effects on fiscal performance are *only* conditional on the presence of the value added tax system (VAT) in the remittance dependent countries. Even after factoring in the endogeneity of remittances and the adoption of the value added tax, or even after using an alternative measure of remittances, the results still remained robust.

The results interestingly add to the positive link between remittances and debt sustainability analysis in receiving countries (Abdih *et al*., 2009). They are important for at least two reasons. Firstly, they showed that public authorities can take advantage of remittance inflows without taxing them directly, and without creating distortions and reducing incentives to remit. The presence of a VAT is therefore useful to capture the positive effect of remittances on consumption smoothing. Secondly, we got clear policy implications: the adoption of a VAT and measures to increase its effectiveness in remittance dependent countries can help build fiscal space. This is a part of an ongoing work in which we measure the effect of remittances on a *de facto* measure of fiscal space using the framework recently proposed by Aizenman and Jinjarak (2010).

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Table 6.1: Remittances, VAT and the tax revenue ratio.

Period:	1980-2006							
Unit of observation:	Years							
	OLS-FE		LSDVCE		Difference-GMM		System-GMM	
	[1.1]	[1.2]	[1.3]	[1.4]	[1.5]	[1.6]	[1.7]	[1.8]
Remittances (% GDP)	0.006	-0.021	0.005	-0.003	0.128	0.057	-0.025	-0.033
	0.11	0.53	0.56	0.67	1.05	0.76	0.23	0.56
Remittances * VAT		0.116**		0.042***		0.165*		0.116**
		2.21		6.52		1.69		2.44
VAT dummy		-0.859		-0.032		-3.050**		-1.631
		1.12		0.54		2.13		1.47
Tax revenue % GDP (t-1)			0.759***	0.730***	0.656***	0.593***	0.636***	0.638***
			46.66	69.22	7.95	6.80	7.78	9.86
Agriculture value added (% GDP)	-0.208***	-0.204***	-0.054***	-0.053***	-0.238*	-0.471**	-0.253**	-0.341***
	3.53	3.63	4.33	8.26	1.95	2.57	2.27	2.80
Trade openness	0.069***	0.071***	0.030***	0.032***	-0.053	-0.052	0.018	0.025
	3.05	3.16	9.12	18.88	1.29	1.25	0.83	1.35
Population aged 14- (%)	0.076	0.073	0.074***	0.092***	0.035	0.037	0.290*	0.364**
	0.50	0.47	3.76	8.27	0.26	0.21	1.77	2.24
Population aged 65+ (%)	-0.417	-0.506	0.230*	0.248***	0.749	-0.361	0.636**	0.709***
	0.58	0.78	1.77	3.80	1.36	0.41	2.24	2.58
log (1+Inflation)	-1.109	-1.107	-0.084	-0.114	0.207	-0.117	-1.079*	-1.103*
	1.22	1.22	0.58	1.56	0.47	0.20	1.73	1.85
Intercept	19.545**	20.135**					-1.760	-2.586
	2.37	2.56					0.25	0.45
No observations	1702	1702	1640	1640	1526	1492	1640	1600
No countries	98	98	98	98	95	95	98	95
Ho: $\theta_1+\theta_2=0$, p-value		0.093		0.000		0.232		0.016
$\theta_1+\theta_2$		0.09		0.04		0.222		0.083
First order serial correlation p-value					0.000	0.000	0.000	0.000
Second order serial correlation p-value					0.301	0.271	0.204	0.177
Hansen OID test p-value					0.114	0.214	0.095	0.251
No instruments					17	22	15	20

Note: Absolute t-statistics are presented below the corresponding coefficients. Symbols ***, ** and * means significant at 1%, 5% and at 10%. **Dependent variable: Total tax revenue (excluding grants) in percentage of GDP.** LSDVCE means the Least Squares Dummy Variable Corrected Estimator initialized by the OLS-FE estimator. In the system-GMM and difference-GMM framework, the additive term of remittances is taken as endogenous and instrumented by its lagged values. The VAT dummy and the interactive term remittances*VAT are instrumented by the proportion of geographical neighbors with a VAT and by this variable crossed with lagged values of remittances, respectively. Two-steps GMM estimator with the Windmeijer (2005) correction for finite sample bias is implemented.

Table 6.2: Remittances, VAT and the instability of the tax revenue ratio.

Period	1980-2005		
Unit of observation:	Non-overlapping 5-year averages		
	[2.1]	[2.2]	[2.3]
Remittances (%GDP)	0.425	-0.038	-0.004
	1.02	0.36	0.04
Remittances * VAT		-0.245*	-0.185
		1.72	1.53
VAT dummy		-4.525*	-2.377
		1.79	1.07
Instability of tax revenue (t-1)	0.205	0.297**	0.202**
	1.52	2.51	2.29
Trade openness	-0.027	-0.007	-0.025*
	1.36	0.46	1.74
Instability of inflation rate	0.006***	0.006***	0.006***
	7.42	15.58	14.49
Instability of private consumption			0.194**
			2.16
Intercept	9.366***	10.075***	9.738***
	4.76	5.37	5.45
No observations	269	241	235
No countries	96	89	87
Ho: $\gamma_1+\gamma_2=0$, p-value		0.055	0.161
$\gamma_1+\gamma_2=0$		-0.283	
First order serial correlation p-value	0.123	0.093	0.108
Second order serial correlation p-value	0.275	0.301	0.374
Hansen OID test p-value	0.215	0.460	0.387
No instruments	14	20	21

Note: Absolute t-statistics are presented below the corresponding coefficients. Symbols ***, ** and * means significant at 1%, 5% and at 10%. **Dependent variable: Instability of total tax revenue ratio growth rate (excluding grants)**. The VAT dummy takes the value 1 if there is a VAT in at least 3 years in a considered sub-period and 0 elsewhere. In the system-GMM and difference-GMM framework, the additive term of remittances is taken as endogenous and instrumented by its lagged values. The VAT dummy and the interactive term remittances*VAT are instrumented by the proportion of geographical neighbors with a VAT and by this variable crossed with lagged values of remittances, respectively. Two-steps GMM estimator with the Windmeijer (2005) correction for finite sample bias is implemented. Time dummies are included in all specifications.

Table 6.3: Remittances (excluding compensations of employees), VAT and the tax revenue ratio.

Period	1980-2006					
Unit of observation:	Years					
	OLS-FE		Difference-GMM		System-GMM	
	[3.1]	[3.2]	[3.3]	[3.4]	[3.5]	[3.6]
Remittances (% GDP)	0.115	0.034	-0.473	-0.059	-0.131	-0.070
	1.56	0.39	1.44	1.15	1.43	1.27
Remittances * VAT		0.160*		0.145**		0.122**
		1.84		2.07		2.05
VAT dummy		-1.512**		-1.600**		-1.795**
		2.10		2.32		2.26
Tax revenue % GDP (t-1)			0.501***	0.595***	0.612***	0.598***
			3.88	6.99	10.62	11.81
Agriculture value added (% GDP)	-0.212***	-0.217***	-0.401**	-0.231**	-0.186	-0.302***
	4.70	5.10	2.17	2.51	1.49	2.76
Trade openness	0.086***	0.091***	0.037**	0.044***	0.045***	0.034***
	4.10	4.40	2.16	3.17	3.83	2.65
Population aged 14- (%)	0.133	0.102	0.251*	0.154	0.255	0.322***
	0.83	0.65	1.75	1.54	1.58	2.89
Population aged 65+ (%)	-0.861	-0.908	0.206	-0.124	0.608**	0.645***
	1.01	1.18	0.36	0.40	2.42	2.98
log (1+Inflation)	-1.131	-1.160	-0.465	-0.367	0.256	0.224
	1.36	1.41	0.72	0.63	0.58	0.53
Intercept	17.739*	19.707**			-3.071	-1.390
	1.89	2.24			0.73	0.39
No observations	1746	1746	1558	1530	1674	1645
No countries	96	96	96	96	96	96
Ho: $\theta_1+\theta_2=0$, p-value		0.025		0.100		0.114
$\theta_1+\theta_2$		0.194		0.086		0.052
First order serial correlation p-value			0.003	0.000	0.000	0.000
Second order serial correlation p-value			0.324	0.218	0.280	0.264
Hansen OID test p-value			0.688	0.350	0.147	0.368
No instruments			12	20	12	16

Note: Absolute t-statistics are presented below the corresponding coefficients. Symbols ***, ** and * means significant at 1%, 5% and at 10%. **Dependent variable: Total tax revenue (excluding grants) in percentage of GDP**. In the system-GMM and difference-GMM framework, the additive term of remittances is taken as endogenous and instrumented by its lagged values. The VAT dummy and the interactive term remittances*VAT are instrumented by the proportion of geographical neighbors with a VAT and by this variable crossed with lagged values of remittances, respectively. Two-steps GMM estimator with the Windmeijer (2005) correction for finite sample bias is implemented.

Table 6.4: Remittances (excluding compensations of employees), VAT and the instability of the tax revenue ratio.

Period	1980-2005		
Unit of observation:	Non-overlapping 5-year averages		
	[4.1]	[4.2]	[4.3]
Remittances (%GDP)	-0.125	0.391	0.283
	0.64	1.16	0.63
Remittances * VAT		-0.775**	-0.524
		2.07	1.16
VAT dummy		-1.252	-2.677
		0.43	1.00
Instability of tax revenue (t-1)	0.240**	0.168**	0.168**
	2.12	1.96	2.51
Trade openness	0.061	0.089	0.023
	0.72	0.96	0.23
Instability of inflation rate	0.006***	0.006***	0.006***
	6.72	10.26	7.56
Instability of private consumption			0.186*
			1.69
Intercept	6.014	4.607	7.268
	1.29	0.92	1.60
No observations	269	252	243
No countries	93	88	85
Ho: $\gamma_1+\gamma_2=0$, p-value		0.024	0.267
$\gamma_1+\gamma_2=0$		-0.384	
First order serial correlation p-value	0.114	0.146	0.133
Second order serial correlation p-value	0.248	0.305	0.400
Hansen OID test p-value	0.773	0.761	0.796
No instruments	14	19	20

Note: Absolute t-statistics are presented below the corresponding coefficients. Symbols ***, ** and * means significant at 1%, 5% and at 10%. **Dependent variable: Instability of total tax revenue ratio growth rate (excluding grants)**. The VAT dummy takes the value 1 if there is a VAT in at least 3 years in a considered sub-period and 0 elsewhere. In the system-GMM and difference-GMM framework, the additive term of remittances is taken as endogenous and instrumented by its lagged values. The VAT dummy and the interactive term remittances*VAT are instrumented by the proportion of geographical neighbors with a VAT and by this variable crossed with lagged values of remittances, respectively. Two-steps GMM estimator with the Windmeijer (2005) correction for finite sample bias is implemented. Time dummies are included in all specifications.

Appendix F: Summary statistics and list of countries in the sample

Variables	Obs.	Mean	Std dev.	Minimum	Maximum
	Annual observations				
Tax revenue % GDP	2341	20.38	9.03	1.30	70.90
Remittances and Compensations % GDP	2463	4.74	8.35	0	90.42
Remittances % GDP	2561	2.81	5.23	0	41.51
VAT dummy	3888	0.38	0.48	0	1
Percentage of other VAT adopters in the region	3888	37.68	28.59	0	100
Agriculture value added share (%)	3104	23.18	14.51	1.61	93.98
Trade openness (%)	3181	75.48	39.62	1.53	280.36
Population aged 65+ (%)	3648	4.89	2.89	1.89	17.32
Population aged 14- (%)	3648	38.14	8.44	13.57	51.92
log (100+inflation rate)	3295	0.20	0.47	-0.34	5.59
	5-year averaged observations				
Tax revenue instability	427	13.38	13.95	0.52	195.78
Remittances and Compensations % GDP	483	4.52	8.12	0	78.68
Remittances % GDP	514	2.67	4.86	0	33.15
VAT dummy	720	0.35	0.48	0	1.00
Percentage of other VAT adopters in the region	720	35.16	27.14	0	89.58
Trade openness (%)	606	74.70	38.36	2.35	226.87
Inflation instability	619	104.00	655.15	0.50	11158.63
Instability of real private consumption per capita growth rate	550	8.44	27.05	0.37	617.30

Countries in the sample (98): Albania, Algeria, Angola, Argentina, Armenia, Azerbaijan, Bangladesh, Belarus, Belize, Benin, Bolivia, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Rep., Chad, Chile, China, Colombia, Comoros, Congo Rep., Costa Rica, Cote d'Ivoire, Djibouti, Dominican Rep., Ecuador, Egypt, El Salvador, Eritrea, Ethiopia, Fiji, Gabon, Gambia, Georgia, Ghana, Guatemala, Guinea, Guinea-Bissau, Haiti, Honduras, India, Indonesia, Iran, Jamaica, Jordan, Kazakhstan, Kenya, Kyrgyz Rep., Lao PDR, Lebanon, Lesotho, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mexico, Moldova, Mongolia, Morocco, Mozambique, Namibia, Nepal, Nicaragua, Niger, Nigeria, Pakistan, Papua New Guinea, Paraguay, Peru, Philippines, Rwanda, Senegal, Sierra Leone, South Africa, Sri Lanka, Sudan, Suriname, Swaziland, Syrian Arab Rep., Tajikistan, Tanzania, Thailand, Togo, Tonga, Tunisia, Uganda, Ukraine, Vanuatu, Vietnam, Yemen Rep., Zambia, Zimbabwe.

General conclusion

Main results

This thesis has examined the consequences of remittance inflows in developing countries by relying on cross country data. It consists of two parts: the impact of remittance inflows on several indicators of the aggregate welfare and the impact of remittances on the public policy in receiving countries. The thesis begins (Chapter 1) by an analysis of the effect of remittances on the share of people selling low wages. The results of the econometric estimations reveal that remittances lead to a decrease in the prevalence of working poor in receiving economies. In addition, this effect appears stronger in a context of high macroeconomic volatility but is mitigated by the unpredictability of remittances: remittances are more effective to decrease the share of working poor when they are easily predictable. Moreover, domestic finance and remittances are substitutes: remittances are less efficient in reducing the prevalence of working poor whenever finance is available.

The analysis of the consequences of remittances on the aggregate welfare is extended toward the issue of their stabilizing effects (Chapters 2 and 3). Several results emerged. First, remittances significantly reduce household consumption instability. Second, remittances play an insurance role by dampening the effects of various sources of consumption instability in developing countries (natural disasters, agricultural shocks, discretionary fiscal policy, systemic financial and banking crises and exchange rate instability). Third, the stabilizing role played by remittances is stronger in less financially developed countries. Fourth, the overall stabilizing effect of remittances is mitigated when remittances exceed 6% of GDP. Fifth, the dependency from remittance inflows helps dampen the destabilizing consequences of natural disasters on the aggregate output. Indeed, it appeared that the effect of natural disasters

disappears for a remittance ratio above 8% of GDP. However, remittances aggravate the destabilizing effects of natural disasters when they exceeded 17% of GDP.

The second part of the thesis focuses on consequences of remittance inflows on public policy. This second part begins with an analysis of the effect of remittance inflows on the elasticity of the government final consumption ratio with respect to trade openness (Chapter 4). The hypothesis that there is a partial substitution between public insurance through government spending and a private insurance through remittances in more open countries is tested. The insurance role of remittances is examined by computing annual panel data coefficients of remittance cyclicality with respect to the real GDP cycle. It appears that remittances have become more countercyclical during the end 1990s. In addition, the trade openness, natural disasters, inflation and the shallowness nature of the financial system are among the main determinants of the countercyclicality of remittance inflows to developing countries. From a simple theoretical model close to Rodrik (1998) and on the basis of econometric estimations, it emerges that the positive impact of trade openness on government spending decreases with the level of remittances. Moreover, the mechanism described here works when remittances are effectively countercyclical.

The analysis of the effect of remittances on the government has continued with an exploration of the consequences of remittance inflows on the willingness of public authorities to subside the social sectors (education and health sectors), a phenomenon called the public moral hazard problem (Chapter 5). Using a large sample of developing countries the results suggest a negative impact of remittances on public spending on education and health when governance is bad in remittance-dependent economies. These results are robust to alternative measures of governance quality.

The last result of the thesis concerns the implications of remittance inflows on the fiscal space in the receiving economies (Chapter 6). The chapter hypothesizes that remittances could increase fiscal space in the dependent economies through their positive effects on the level and the stability of the government tax revenue ratio. However, this fiscal impact depends strongly upon the presence of the value added tax system in the countries. This is supported by the fact that remittances are largely used for consumption purposes and smooth the private consumption. The econometric investigations have validated these hypotheses.

To sum up, this thesis has shown that remittances represent an effective pro-poor engine and positively affect the welfare of the receiving households. However, this effect is not linear and conditional on the levels of financial development and remittances. The results also uncover that remittances could induce a fiscal retrenchment even in the social sectors and could therefore lead to a public moral hazard problem. Regardless, remittances inflows help build fiscal space in countries having adopted a VAT.

Policy implications

The main challenge for remittance-dependent economies is to design policies that increase the level of remittance inflows, foster their benefits while mitigating adverse side effects (Chami, 2011). This thesis has therefore clear policy implications to achieve these objectives.

First, given the positive effects that remittances exert on the welfare, their level must increase. For many developing countries especially the less financially developed ones remittances obviously have pro-poor effects. However, the level of remittance inflows is constrained by the high transfer costs associated with the lack of financial inclusion and competition amongst the Money Transfer Operators. Hence, the international community should move toward clear actions favoring the reduction of remittance transaction costs in poor countries. The

declaration of the Aquila summit in 2009 calls for such actions: "*Given the development impact of remittance flows, we will facilitate a more efficient transfer and improved use of remittances and enhance cooperation between national and international organizations, in order to implement the recommendations of the 2007 Berlin G8 Conference and of the Global Remittances Working Group established in 2009 and coordinated by the World Bank. We will aim to make financial services more accessible to migrants and to those who receive remittances in the developing world. We will work to achieve in particular the objective of a reduction of the global average costs of transferring remittances from the present 10% to 5% in 5 years through enhanced information, transparency, competition and cooperation with partners, generating a significant net increase in income for migrants and their families in the developing world*".

The World Bank in its "remittance prices worldwide" web portal recognizes that cutting prices by at least 5 percentage points can save up to $16 billion a year. This amount approximately represents 5% of the total amount of remittances received by the developing countries in 2010 and around 75% of the amount of remittances received by a region such as Sub-Saharan Africa. Increasing the competition amongst the MTO is one of the main urgent actions. This can also take the form of a more effective inclusion of banks in the remittance market. One could expect a reduction in transaction costs but also simplification of the procedures.

In the remittance-dependent countries, clear actions toward increasing the level of these funds could be also undertaken. As it has been shown by Freund and Spatafora (2008) and Beck and Martinez Peria (2009), sustaining financial development and competition in the banking system and in the remittance market significantly reduces the transaction costs associated with remittances.

The role of the financial development is not limited to its contribution to the rise of remittances but also serves as a way to increase the absorption capacity of remittances and to limit the Dutch disease risks. Indeed, this thesis has shown that in certain circumstances remittance inflows could be destabilizing. This arises when these inflows are too high compared with the size of the receiving economies (Chapter 2). One of the strategies which could mitigate these adverse side effects is to increase the level of financial development. As it has been shown by Acosta et al. (2009), financially developed countries are less concerned by the Dutch disease effects of remittance inflows compared to the others. This arises because well-developed financial sectors can more effectively channel remittances into investment opportunities, what prevents from exchange rate appreciation. Moreover, the reinvestment of remittances could lead to a better social equilibrium with more people – not only the receiving households – taking advantage of remittance inflows due to the diffusion effects of remittances in the economy.

In addition, the amelioration of investment climate in a broader sense could certainly help achieving the objective of the reinvestment of remittances. Actions toward the reduction of the costs to start a business at home and better information on the investment opportunities provided to the migrants, should increase the share of remittances devoted to the investment and should enhance the developmental effects of remittances in poor countries.

However, the risk associated with remittances being more efficient in reducing poverty and promoting long term economic growth is that governments may become reluctant to do their own part of the job. The thesis has shown that the public moral hazard effect exists especially in badly governed countries. Hence, the positive effects of remittances on welfare can be neutralized by the reduction of government incentives to enact policy reforms, to subside

social sectors and finally to provide public goods. This risk seems to be important and actions toward an improvement of governance quality in developing countries are therefore needed.

Regarding the government revenue side, the thesis says something about the choice of the appropriate taxation system in the remittance-dependent countries. The adoption of the VAT could help create and secure fiscal space in receiving economies.

This thesis has highlighted that remittances could foster economic development in developing countries but at the same time, some beware news exist and the challenge is to design policies that maximize benefits while mitigating adverse side effects.

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Contents

General introduction 1
References 16

Part 1. Remittances and aggregate welfare 21

Chapter 1. Remittances and the prevalence of working poor in developing countries 22
1.1. Introduction 23
1.2. Preliminary evidence and overview of the existing literature 26
1.3. Do remittances reduce the prevalence of working poor? Empirical investigation. 29
1.4. Testing for heterogeneity in the working poor-remittance nexus. 35
1.5. Conclusion 40
References 42
Appendix A: Measuring the prevalence of working poor, descriptive statistics and list of countries 54

Chapter 2. Remittances and household consumption instability 57
2.1. Introduction 58
2.2 Do remittances reduce household consumption instability? 61
2.3. What shocks are mitigated by remittances? 67
2.4. Heterogeneities in the levels of financial development and remittances: testing for nonlinearities 70
2.5. Robustness checks 74
2.6. Concluding remarks 75
References 76
Appendix B. Data definitions and sources of variables 92

Chapter 3. Do remittances dampen the effects of natural disasters on output growth volatility? 94
3.1. Introduction 95
3.2. Econometric Specifications and Preliminary Results 97
3.3. Robustness Checks 104
3.4. Concluding remarks 110
References 111
Appendix C: Descriptive statistics and list of countries in the sample 120

Part 2. Remittances and the Government 121

Chapter 4. Remittances, openness and government size 122
4.1. Introduction 123
4.2. A simple theoretical model of remittances, external risk and government size 126
4.3. Time-varying measure of remittance cyclicality 130
4.4. Remittances, openness and government size: Econometric analysis 138
4.5. Remittance cyclicality, openness and government size 142
4.6. Concluding remarks 143
References 145
Appendix D: Descriptive statistics and list of countries in the sample 155

Chapter 5. Do remittances lead to a public moral hazard? 157
5.1. Introduction 158
5.2. Empirical design 162
5.3. Results 170
5.4. Robustness checks 173
5.5. Concluding remarks 177
References 179
Appendix E 191

Chapter 6. Remittances, value added tax and tax revenues 194
6.1. Introduction 195
6.2. Empirical analysis 199
6.3. Estimation results 205
6.4. Concluding remarks 209
References 211
Appendix F: Summary statistics and list of countries in the sample 218

General conclusion 219
References 225
Contents 226

List of tables

Table 1.1: Remittances and Percentage of Working Poor, OLS-FE results 49
Table 1.2: Remittances and Working Poor rate, IV-FE results 50
Table 1.3: Remittances, income shocks and Working poor rate 51
Table 1.4: Remittances, remittance unpredictability-and Working poor rate 52
Table 1.5: Remittances, financial development and Working Poor rate, IV-FE results 53
Table A1: Descriptive statistics 55
Table A2. Countries in the sample (85) 56
Table 2.1: Household consumption instability in developing countries 80
Table 2.2 : Descriptive statistics 81
Table 2.3: Impact of remittances on consumption instability 82
Table 2.4: Remittances, various shocks and consumption instability: Testing for the insurance role 83
Table 2.5: Remittances, financial constraints and household instability 84
Table 2.6: Remittances, financial constraints and consumption instability: Nonlinear System-GMM method 85
Table 2.7: Threshold effects in the relationship between remittances and consumption instability: Nonlinear System-GMM method 86
Table 2.8: Remittances and consumption instability: Alternative measures of financial development 87
Table 2.9: Remittances and consumption instability: Alternative measures of remittances 88
Table 3.1: Remittances, people affected and output growth volatility 116
Table 3.2. Natural disasters, remittances and output growth volatility: More controls 117
Table 3.3. Alternative measures of disasters 118
Table 3.4: Threshold levels of remittances: Non-linear system-GMM analysis 119
Table 4.1: Trade openness and the procyclicality of remittances: OLS with country fixed-effects estimator. 150
Table 4.2: Remittances per capita, Openness and Government consumption 151
Table 4.3: Remittances (%GDP), Trade openness and Government consumption 152
Table 4.4. Remittance cyclicality, Openness and Government Consumption 153
Table 4.5: Bootstrapped standard-errors 154
Table D1: Descriptive statistics 155
Table D2. List of countries (67) 156
Table 5.1: Governance quality, remittances and public education spending, difference-GMM estimation results 183
Table 5.2 : Governance quality, remittances and public education spending, system-GMM estimation results 184
Table 5.3: Governance quality, remittances and public health spending, difference-GMM estimation results 185
Table 5.4 : Governance quality, remittances and public health spending, system-GMM estimation results 186
Table 5.5 Governance quality, remittances and public education spending, system-GMM-IV with a Common Factor representation. 187
Table 5.6: Governance quality, remittances and public health spending, system-GMM-IV with a Common Factor representation. 188
Table 5.7: Governance quality, remittances and public education spending, Results using the principal component analysis of the governance indicators. (system-GMM estimator) 189

Table 5.8: Governance quality, remittances and public health spending, Results using the principal component analysis of the governance indicators (system-GMM estimator)..... 190
Table E1: Descriptive statistics 191
Table E2: Aggregating governance variables: principal components analysis (*first eigenvector, correlation*) 192
Table E3: List of countries in the sample (86) 193
Table 6.1: Remittances, VAT and the tax revenue ratio. 214
Table 6.2: Remittances, VAT and the instability of the tax revenue ratio. 215
Table 6.3: Remittances (excluding compensations of employees), VAT and the tax revenue ratio..... 216
Table 6.4: Remittances (excluding compensations of employees), VAT and the instability of the tax revenue ratio. 217

List of figures

Figure 1.1. Distribution of the prevalence of working poor in the developing regions (1990-2007)..... 47
Figure 1.2. Correlation between the prevalence of working poor and remittance inflows (1990-2007). 48
Figure 2.1. Consumption instability and remittances in developing regions, 1975–2004. 89
Figure 2.2. Evolution of the coefficient associated with the interactive term of remittances crossed with the private credit ratio: Nonlinear System-GMM Estimation 90
Figure 2.3: Evolution of the coefficient associated with the nonlinear term in remittances: Nonlinear System GMM Estimation 91
Figure 3.1. Distribution of natural disasters, remittances and output per capita growth volatility over regions (1980-2007)..... 114
Figure 3.2. Output growth volatility and natural disasters 115
Figure 4.1. Testing the strength of the instruments: summary of first-stage results 149
Figure 4.2. Testing the orthogonality of the instruments: summary of first-stage results 149
Figure 4.3: Evolution of the countercyclicality of remittances 149

Summary of the thesis

This thesis focused on the consequences of remittance inflows in developing countries. The first part explored the *causal* impacts of remittances on some indicators of aggregate welfare while the second part examined the effects of remittances on public policy. Several results emerged. First, remittance inflows help reduce the proportion of individuals selling low wages and this effect is stronger in a context of low level of financial development, high macroeconomic instability and less unpredictable remittances (**Chapter 1**). Second, remittances have a robust stabilizing impact on the private consumption. However, this effect tends to decrease with the levels of remittance inflows and financial development. Moreover, remittance-dependent economies seem to be strongly sheltered against the damaging effects of various types of shocks affecting consumption (**Chapter 2**). In **Chapter 3**, the results highlighted that remittance inflows dampen the positive effect of natural disasters on the output growth volatility. However, this impact was strongly reduced as the level of remittances increased. The second part of the thesis revealed interesting results regarding the effects of remittance inflows on public policy. First, remittance inflows reduce the insurance role played by the government consumption in more open economies and this effect is more likely to hold when remittances exhibit a countercyclical behavior (**Chapter 4**). In **Chapter 5**, the results showed that the fiscal retrenchment induced by remittance inflows, is particularly marked for the public education and health spending in countries characterized by various types of governance problems. Finally, the thesis showed that the effects of remittances do not only concern the expenditure side but also the revenue side. Remittances are more likely to increase the fiscal space in receiving economies that rely on the value added tax system. In these countries, remittance inflows help increase both the level and the stability of the government tax revenue ratio **(Chapter 6)**.

Keywords: Remittances, financial development, working poor, consumption instability, natural disasters, output growth volatility, public spending, tax revenues

Résumé de la thèse

Cette thèse s'intéresse aux effets macroéconomiques des envois de fonds des migrants dans les pays en développement. La première partie de la thèse analyse l'effet *causal* des envois de fonds sur plusieurs indicateurs de bien-être, tandis que la deuxième partie examine l'effet des envois de fonds sur la politique publique des pays receveurs. Plusieurs résultats émergent. Premièrement, les envois de fonds des migrants réduisent significativement la part des individus travaillant pour moins de 2 dollars et cet effet apparaît renforcé dans un contexte de faible développement financier, forte instabilité macroéconomique et forte prévisibilité des envois de fonds (**Chapitre 1.**). Deuxièmement, les envois de fonds réduisent l'instabilité de la consommation privée et cet effet est d'autant plus important que le niveau de développement financier est faible et que le niveau des envois de fonds est faible. Par ailleurs, les envois de fonds absorbent différents types de chocs (**Chapitre 2.**). Troisièmement, les envois de fonds atténuent significativement les effets des catastrophes naturelles sur l'output agrégé, cependant cet effet stabilisateur diminue avec le niveau d'envois de fonds reçus (**Chapitre 3.**). La deuxième partie de la thèse analyse l'impact des envois de fonds des migrants sur la politique publique. Premièrement, il apparaît que la contracyclicité des envois fonds contribue à réduire le rôle d'assurance joué par la consommation publique dans les pays ouverts sur l'extérieur (**Chapitre 4.**). Deuxièmement, les envois de fonds réduisent significativement la part des dépenses publiques sociales dans les pays caractérisés par une mal gouvernance (**Chapitre 5.**). Troisièmement, les envois de fonds contribuent à accroître à la fois le volume et la stabilité du taux de recettes fiscales dans les pays ayant adopté une taxe sur la valeur ajoutée (**Chapitre 6.**).

Mots clés : Envois de fonds, développement financier, salaire, instabilité de la consommation, désastres naturels volatilité du taux de croissance du PIB par tête, dépenses publiques, recettes fiscales.