



Remittances and Economic Growth: Analysis of the Direct and Indirect Effects

Zoé Docquier¹

March 2017

¹ Student Number: 427392. E-mail: zodocquier@gmail.com
Master's Thesis in International Economics
Supervisor: Dr. Maarten Bosker

Abstract

As remittances inflows have increased steadily in the recent years, researchers and policy makers have analyzed more and more the impact those flows have on economic development. However, the literature has not reached a consensus on whether remittances were beneficial or not for economic growth. This paper investigates the direct and indirect effects of remittances on economic growth using a dataset of 129 countries between 1980 and 2014. The potential stabilizing role of remittances on output volatility will be analyzed as well. I extended the Augmented Solow Model developed by Mankiw, Romer and Weil (1992) with remittances to highlight two main growth channels: human and physical capital accumulation. Results showed that remittances had a direct positive impact on economic growth which was enhanced where physical and human capital accumulation levels were low. Furthermore, remittances are not used as a way to smooth consumption. Results therefore show that households use remittances to save and invest in education and that those flows are a source of capital for development.

Keywords: Remittances, Economic Growth, Human Capital Accumulation, Physical Capital Accumulation, Output Volatility

TABLE OF CONTENTS

1. Introduction.....	5
2. Literature Review.....	6
2.1 Motivations behind remittances.....	6
2.1.1 Pure Altruism.....	6
2.1.2 Pure Self-Interest.....	7
2.1.3 Tempered Altruism or Enlightened Self-Interest.....	7
2.1.4 Macro – Determinants of Remittances.....	8
2.2 Remittances and Economic Growth.....	8
2.2.1 Capital accumulation.....	9
2.2.2 Investment or Consumption?.....	10
2.3 Remittances and Output Volatility.....	10
3. Modelling Framework.....	11
3.1 Remittances and economic growth.....	11
3.1.1 The Augmented Solow Model.....	12
3.1.2 Specifications.....	13
3.2 Remittances and Output Volatility.....	17
3.3 Estimation Techniques.....	18
4. Data.....	18
4.1 Data Sources.....	18
4.1.1 Control Variables.....	19
4.2 Descriptive Statistics.....	19
5. Results.....	22
5.1 Remittances and Economic Growth.....	22
5.2 Physical and Human Capital Accumulation as Channels.....	26
5.3 Output Volatility.....	29
6. Conclusion.....	31
7. Bibliography.....	33
8. Appendix.....	37

LIST OF TABLES

Table 1: Remittances (in billion dollars)	20
Table 2: Remittances (as a percentage of GDP)	20
Table 3: Remittances and Economic Growth Results - Pooled OLS.....	25
Table 4: Remittances and Economic Growth – Fixed Effects.....	26
Table 5: Human Capital Accumulation Channel Equation - Results	28
Table 6: Physical Capital Accumulation Channel Equation - Results.....	28
Table 7: Output Volatility per Capita - Fixed Effects.....	30
Table 8: Variables Definition.....	37
Table 9: Summary Descriptive Statistics.....	38
Table 10: Remittances and Economic Growth – Fixed Effects – Robustness Check ..	38
Table 11: Remittances and Economic Growth – Fixed Effects – Robustness Check ..	39
Table 12: Remittances and Human Capital Accumulation– Fixed Effects – Robustness Check	40
Table 13: Remittances and Physical Capital Accumulation– Fixed Effects – Robustness Check	40
Table 14: Remittances and Output Volatility per Capita – Fixed Effects – Robustness Check	41

LIST OF FIGURES

Figure 1: Top 20, remittances receiving economies (as a percentage of GDP).....	21
Figure 2: Top 20, remittances receiving economies (in billion dollars).....	21
Figure 3: Remittances, ODA, FDI inflows (as a percentage of GDP).....	22

1. Introduction

Whether due to economic reasons, conflicts and wars, or climatic changes, the accelerated globalisation pace caused migration to sharply rise in recent years. With more than 247 million people², or 3.4 percent of the world population³, living outside their origin country, migration is subject to debate among researchers and policy makers. However as highlighted by Dilip Ratha⁴ “Migration is overwhelmingly beneficial but there are some costs that bias public perceptions towards the negative” . One of the channels through which migration could be welfare enhancing are the funds received from migrants working abroad, the so-called remittances. In 2015, remittances to developing countries exceeded \$441 billion, three times the amount of official development assistance (ODA). Numerous studies have looked at the impact of remittances on economic development and the results have been ambiguous. Some studies have found that remittances alleviate poverty and provide an alternative source of capital to fund investments and promote education (Guiliano and Ruiz-Arranz, 2009; Fayissah and Nshiah, 2010; Adams and Page, 2005). While others show that remittances are not compensatory and do not serve as a source of capital for development (Chami et al., 2005).

This research paper investigates the direct and indirect effects of remittances on economic growth using a panel dataset containing 129 countries from 1980 to 2014. I further examine the potential stabilizing role of remittances on output volatility. The main contribution of this thesis is the introduction of remittances through two channels, physical and human capital accumulation, using the Augmented Solow Model developed by Mankiw, Romer and Weil (1992). Due to mathematical limitations, I was not able to theoretically demonstrate the empirical specifications. I however make assumptions on how to theoretically introduce remittances in the Augmented Solow Model and empirically define remittance-extended specifications. When first testing for the direct effect of remittances on growth, I find a positive relationship. This result leads to believe that remittances act as opportunistic and not compensatory funds as

² Migration and Remittances Factbook 2016, World Bank

³ Migration and Remittances Factbook 2016, World Bank

⁴ Head of the Global Knowledge Partnership on Migration and Development (KNOMAD) and one of the lead author of the *Migration and Remittances Factbook 2016*.

found by Chami et al. (2005). The idea that remittance flows indeed act as a source of capital for development is comforted by the positive effect remittances have on both physical and human capital accumulation. The estimated channel equations help highlight the indirect effect remittances have in increasing investment in savings and education. Furthermore, I also find that remittances specially boost growth where the level of physical and human capital accumulation is low. Finally, I do not find evidence that households use remittances to smooth their consumption in presence of business cycles.

The rest of the paper is structured as follows. Section 2 presents a review of the literature, section 3 outlines the modelling framework as well as a description of the employed data. In section 5 I discuss the analysis results and finally section 6 concludes.

2. Literature Review

The sharp increase in remittances in the 90s have led economists and researchers to investigate their economic consequences. The literature review will first cover the motivation individuals have to remit, mainly pure altruism, self-interest and tempered altruism as well as the macro determinants. We will then consider the effects that remittances have on economic growth and the different channels that enhance their impact.

2.1 Motivations behind remittances

Whether individuals remit out of pure altruism, pure self-interest or tempered altruism, family plays a central role in remittance decisions. Indeed, the entire family shares the costs and benefits of remitting, and the motivations behind those transfers can be categorized by the relationships within the family. The transfer flows may thus be seen as a private mechanism of income redistribution.

2.1.1 Pure Altruism

Altruism arises when a migrant is worried over the economic situation of the family members left behind. An increase in remittances would thus be observed following a

natural disaster or a financial crisis. Lucas and Stark (1985), as well as Johnson and Whitelaw (1985), define an altruistic utility. They state that the utility of the migrant is directly linked to the consumption of the remittances recipients. They found that when the migrant earnings soar, payments increase as well. Agarwal and Horowitz (2002) also conclude that altruism motivates remittance flows. They found that the amount remitted decreases when the income of the recipient rises and decline in magnitude over time with fading family attachment.

2.1.2 Pure Self-Interest

Nonetheless, Lucas and Stark (1985) also find evidence of pure self-interest motivation. Individuals remitting non-altruistically may emerge for different reasons. Firstly, migrants might remit with the ambition of inheriting a larger portion of the family's assets. Their evidence suggests that when households have larger herds, remittances tend to be higher to maintain favour in inheritance. Secondly, individuals tend to invest in their home country. They would then use their family as a financial intermediary and remittances would thus be seen as compensation for supervising and maintaining an investment such as a property or business. Finally, individuals, with the intent of returning home may invest in the form of savings or property.

2.1.3 Tempered Altruism or Enlightened Self-Interest

Furthermore, as defined by Lucas and Stark (1985), remittances can also be seen as an "intertemporal, mutually beneficial contractual arrangement between migrant and home." This informal contract implies two aspects: an investment in human capital and an income source diversification strategy.

On the one hand, as highlighted by the implicit loan theory (Poirine, 1997), remittances could be considered as reimbursement for financial support provided before departure. This implicit loan intended to cover migration costs and securing a better education.

On the other hand, recipients may also benefit from remittances and perceive them as a diversification mechanism. Households may send family members abroad to acquire different sources of income. Agarwal and Horowitz (2002), found empirical evidence that when households have the possibility to vary their income through migration, riskier and more profitable investments are made. Besides, remittances diminish their exposure to economic volatility and allow them to smooth consumption (Brown, 2006).

In consequence, both parties benefit from coinsurance as this kind of informal contract implies an exchange of commitments (Stark and Bloom, 1985).

2.1.4 Macro – Determinants of Remittances

El-Sakka and McNabb (1999) consider the case where remittances are affected by macroeconomic variables. On the one hand, the economic status of the host country may impact remittances. Indeed, if the economy faces a downturn, demand for migrant workers and hence wages might decrease. The fall in earnings can directly have an impact on consumption, saving and thus remittance behaviour. On the other hand, in the country of origin, numerous factors could have an impact on the amount of money remitted. First, as remittances may be altruistically driven, the amount of money sent will tend to be higher when the average level of income is lower. Second, to keep consumption levels unchanged following a rise in the inflation rate, migrants might remit more. However, as higher inflation rates tend to depreciate the domestic currency, the motivation to transfer foreign currency may decrease. Moreover, as Elbadawi and Rocha (1992) show, inflation rates can rise when a country is experiencing economic and possibly political unrest. Due to uncertainty and risk, individual may thus be reluctant to remit. Third, whether individuals invest back home will largely depend on the difference between the rates of return in the home and host country. Lower premiums on foreign rates over domestic ones tend to encourage migrants to remit. Finally, when choosing a transferring channel, unofficial channels will also be preferred in the presence of financial flow taxation.

2.2 Remittances and Economic Growth.

Remittances can affect economic performance through different channels. In this section, evidence of the effect of remittances on economic growth will be presented, even though the literature is not conclusive.

2.2.1 Capital accumulation

As highlighted by Barajas et al. (2009), remittances can impact capital accumulation in recipient economies. Mainly by easing financial restrictions, remittance flows allow households to increase their accumulation of physical and human capital.

With regards to human capital accumulation, empirical evidence shows that the impact of remittances on education is positive. Guha (2013), finds that in developing economies, households spend more on child education and health when receiving remittances. Acosta (2006) supports that, in El Salvador, remittances recipient's households are more likely to send their children to school. Garcia et al. (2009) show that with a minimum level of human capital, remittances and growth are complementary.

Furthermore, the development of the home country financial system also has a role regarding remittances impact on growth. Cooray (2012), found that, in South Asia, a developed financial sector enhances remittances effect on economic performance. Fayissah and Nsiah (2010), provide evidence that remittances, by providing an alternative way to finance investment and relaxing liquidity constraints, positively influence economic growth.

Additionally, Guiliano and Ruiz-Arranz (2009) confirm that by substituting for a lacking banking sector, remittances help alleviate credit constraints and bolster economic growth. However, Betting and Zazzaro (2011), contrary to the previous findings, provide evidence for complementarity between remittances and the financial system level of development. Remittances would boost growth only in countries where the financial sector is well developed. Furthermore, as explained by Barajas et al. (2009) "Growth Accounting" Framework, this easier access to credit could lead to moral hazard behaviour. Having access to remittances may encourage recipients to lower labour supply, considering remittances as labour income. There would, therefore, be a negative relationship between remittances, labour force participation and hence economic growth.

2.2.2 Investment or Consumption?

However, for remittances to have a positive impact on economic growth, individuals need to use these flows to accumulate capital. One may thus ask whether remittance flows are compensatory or opportunistic and therefore used for consumption purposes.

Studies find that when remittances are used for consumption purposes, long-term growth suffers (Chami et al., 2005). Furthermore, remittances, as explained above, may discourage recipients from entering the labour market (Chami, 2008). Chami et al. (2005), investigate the behaviour of remittances in comparison to other capital flows and found that remittances negatively impact economic growth. They conclude that remittances do not appear to be used as financing investment, but rather smooth consumption and compensate for an economic downturn. Furthermore, Le (2011) finds that migrants besides sending money to their families also invest in their home country. As explained above remittances are then seen as monetary compensation for maintaining an investment. Guiliano and Arranz (2009), also look at how recipients spend these transfer flows and found that remittances promote growth through an investment channel, particularly where households are more financial constrained.

2.3 Remittances and Output Volatility

It has been shown that in the long term, remittances are a more sustainable source of revenue than other international financial flows such as FDIs and ODAs. Households are thus expected to use a larger share of remittances for consumption purposes in periods of recession or when natural disaster occur.

Consequently, remittances, as a potential channel of business cycles transmission, may not be stabilizing. However, from the macro point view, Chami et al. (2009 and 2012) found that remittance inflows had an adverse impact on output growth volatility and were, on average, stabilizing. Bugamelli and Paterno (2008) conclude that a larger output growth volatility discourages investment-financing and boosts consumption-financing remittances, confirming the smoothing role of remittances.

De et al. (2016) show that the reaction of remittances to business cycles fluctuation highly depends on the motives to remit. In line with the literature, they found that

remittances could help stabilizing consumption in the presence of economic downturn. The relevance of their study stands in their interpretation of remittances cyclical behaviour. According to them, it is all about the motivation behind remitting. First, if the migrant remits out of altruism, remittances would soar when the receiving economy is in a downturn. Remittances are then counter-cyclical. The same logic applies to an insurance or strategically oriented motive. On the contrary, if an individual remits to invest, a favourable economic situation in the country of origin would increase remittances. Remittances would then be pro-cyclical. We would also observe pro-cyclicality in the case of self-interest motives such as a potential inheritance. In favourable economic conditions, the value of the bequest increases and more remittances are sent. In the event of exchange, remittances purchase certain services. In a good economic state, the recipients could get higher returns from other activities than the ones mandated from the sender. Consequently, in order to keep the recipient supervising his investment, the sender would increase the amount of money sent.

3. Modelling Framework

This section will outline the methodology and techniques used to evaluate the direct, indirect and enhancing effect of remittances on growth and its impact on output volatility. The sample will consist of 129 countries for the 1980 – 2014 period. The choice of the study period and sampling of countries were entirely based on data availability.

3.1 Remittances and economic growth

The augmented Solow model of Mankiw, Romer and Weil (1992) will allow to emphasize the different channels through which remittances may impact economic growth, mainly physical and human capital accumulation as mentioned in the literature review. I will first outline the augmented Solow model and then extend the model with remittances.

3.1.1 The Augmented Solow Model

Mankiw, Romer and Weil (1992) add human capital as an input to the basic Solow growth model. The three inputs, physical capital, human capital and labour are paid their marginal products. They assume a Cobb-Douglas production function at time t given by

$$(1) \quad Y(t) = K(t)^\alpha H(t)^\beta (A(t)L(t))^{1-\alpha-\beta}$$

where Y is output, K is physical capital, H is human capital, L is labour, and A is the level of technology. The rates of saving, population growth and technological progress are assumed to be exogenous. L and A thus grow exogenously at rates n and g :

$$(2) \quad L(t) = L(0)e^{nt}$$

$$(3) \quad A(t) = A(0)e^{gt}$$

This implies that the number of effective units of labour, $A(t)L(t)$, grows at rate $n + g$. The evolution of physical and human capital is determined by

$$(4) \quad \dot{k}(t) = s_k y(t) - (n + g + \delta)k(t)$$

$$(5) \quad \dot{h}(t) = s_h y(t) - (n + g + \delta)h(t)$$

where $y = Y/AL$, $k = K/AL$, $h = H/AL$, s_k is the fraction of income invested in physical capital and s_h the fraction invested in human capital. Both capitals are assumed to depreciate at the same rate, δ . Assuming decreasing returns for all capitals ($\alpha + \beta < 1$) allows to reach a steady state. Solving for equations (4) and (5) equal to zero, the steady state is defined by

$$(6) \quad k^* = \left(\frac{s_k^{1-\beta} s_h^\beta}{n+g+\delta} \right)^{1/(1-\alpha-\beta)}$$

$$(7) \quad h^* = \left(\frac{s_k^\alpha s_h^{1-\alpha}}{n+g+\delta} \right)^{1/(1-\alpha-\beta)}$$

Substituting those equations into the production function and taking the logs gives a steady-state income per capita,

$$(8) \ln \left[\frac{Y(t)}{L(t)} \right] = \ln A(0) + gt - \frac{\alpha+\beta}{1-\alpha-\beta} \ln(n + g + \delta) + \frac{\alpha}{1-\alpha-\beta} \ln(s_k) + \frac{\beta}{1-\alpha-\beta} \ln(s_h)$$

This equation thus shows the dependency of income per capita on population growth and accumulation of physical and human capital.

However, it has been shown that the Solow model predicts that countries reach different steady states. Unless steady state determinants are controlled for, there is no income convergence. This is called “Conditional Convergence”. Moreover, the model suggests a regression to study the rate of convergence, λ , to the steady state:

$$(9) \quad \ln(y(t+1)) - \ln(y(t)) = (1 - e^{-\lambda t}) \frac{\alpha}{1-\alpha-\beta} \ln(s_k) + (1 - e^{-\lambda t}) \frac{\beta}{1-\alpha-\beta} \ln(s_h) - (1 - e^{-\lambda t}) \frac{\alpha+\beta}{1-\alpha-\beta} \ln(n + g + \delta) - (1 - e^{-\lambda t}) \ln(y(t))$$

The growth of income is thus a function of the determinants of the ultimate steady state seen above and the initial level of income.

3.1.2 Specifications

A. Benchmark Model

I will first analyse the growth equation based on Mankiw, Romer and Weil (1992). From equation (9), I define a log-linear growth model as follows:

$$(10) \quad Growth = \Delta \ln y_{i,t} = \ln y_{i,t} - \ln y_{i,t-1} = \beta_0 + \beta_1 \ln y_{i,t-1} + \beta_2 \ln s_{k_{i,t}} + \beta_3 \ln s_{h_{i,t}} + \beta_4 \ln(n_{i,t} + g + \delta) + \beta_5 \ln X_{i,t} + \mu_t + \eta_i + \varepsilon_{i,t}$$

where i denotes country, t denotes year, *Growth* is defined as the first difference of the logarithm of real GDP per capita, y denotes real GDP per capita, s_k and s_h are the

rate of physical and human capital accumulation, n is population growth, g is the advancement of technology, δ is the depreciation rate, $X_{i,t}$ is the matrix of control variables, μ_t is a time specific effect, η_i is an unobserved country-specific effect and ε_{it} is the error term.

Physical and human capital are assumed to depreciate at the same rate. In line with Mankiw, Romer and Weil (1992), g and δ are assumed to be constant across all years and countries and $g + \delta$ is assumed to be equal to 0.05. The Solow model predicts that higher physical and human capital accumulation are expected to increase growth and a higher rate of population growth tends to lower income growth. The initial level of real income per capita is used to test for growth convergence. I expect to find evidence of growth convergence, that is higher growth rates for poorer countries.

Based on previous literature, the set of control variables in X_{it} will consist in four explanatory variables. *Trade openness* is expected to improve economic performance by providing access to international markets as well as promoting faster technological innovation and learning from abroad (Balasubramanyan et al., 1996). *Government Spending* is used to capture fiscal policy and the literature has not find a consensus on their relationship. While Keynes (1964) argues that higher government expenditure leads to higher economic growth, other empirical studies such as Barro and Redlick (2009) have found a negative relationship. Based on Guiliano and Ruiz-Arranz (2009), I expect a positive impact of *financial development* on economic performance . Indeed, an easier access to the financial sector will ease the financial restrictions of individuals allowing them to increase their rate of physical and human capital accumulation. Finally, the impact of *FDI inflows* on economic growth relies on country specificities and literature does not have a consensus.

This neoclassical growth model, equation (10), will be used as a benchmark model to see whether including remittances changes the magnitude of the effects of population growth as well as human and physical capital accumulation on growth.

B. Effects of remittances

Direct Effect

To investigate the relationship between remittances and growth, I will first consider that they have a direct effect on output through the level of technology⁵. I therefore extend the above model as follows:

$$(11) \quad \text{Growth} = \Delta \ln y_{i,t} = \ln y_{i,t} - \ln y_{i,t-1} = \beta_0 + \beta_1 \ln y_{i,t-1} + \\ \beta_2 \ln s_{k_{i,t}} + \beta_3 \ln s_{h_{i,t}} + \beta_4 \ln(n_{i,t} + g + \delta) + \beta_5 \ln rem_{i,t} + \beta_6 \ln X_{i,t} + \mu_t + \\ \eta_i + \varepsilon_{i,t}$$

where *rem* is remittances measured as a ratio of GDP, the others variables are defined as above.

This neoclassical growth model allows to test whether the marginal impact of remittances on growth, β_2 is statistically significant. However, the expected sign of the coefficient is theoretically ambiguous. As mentioned before, past researches have been inconclusive on determining whether remittances impact is positive or negative.

Enhancing effect of remittances

I then evaluate the enhancing effect remittances can have with physical and human capital accumulation on economic growth per capita. I therefore interact both capital accumulation with remittances as follows⁶:

⁵ In the augmented Solow model we assume that $A(t) = A(0)e^{gt}$. If we assume that remittances have a direct effect on output through the level of technology, we will have $A(t) = A(0)R(t)e^{gt}$, solving the augmented Solow Model as above with this assumption will result in specification (11).

⁶ Due to mathematical limitations I was not able to demonstrate this specification. However in order to define this empirical specification, I assume that remittances are introduced in the model through the physical and human capital accumulation function, the production function remains unchanged. We would therefore have $k(\dot{t}) = s_k y(t) - (n + g + \delta)k(t) + \gamma r(t)$ and $h(\dot{t}) = s_h y(t) - (n + g + \delta)h(t) + (1 - \gamma)r(t)$, with *r* being remittances, γ the fraction of remittances invested in physical capital and $(1 - \gamma)$ the fraction of remittances invested in human capital. I therefore would make the assumption that remittances are either spent in physical capital or human capital only.

$$(12) \quad Growth = \Delta \ln y_{i,t} = \ln y_{i,t} - \ln y_{i,t-1} = \beta_0 + \beta_1 \ln y_{i,t-1} + \beta_2 \ln s_{k_{i,t}} + \beta_3 \ln s_{h_{i,t}} + \beta_4 \ln(n_{i,t} + g + \delta) + \beta_5 \ln rem_{i,t} + \beta_6 (\ln s_{k_{i,t}} * \ln rem_{i,t}) + \beta_7 (\ln s_{h_{i,t}} * \ln rem_{i,t}) + \beta_8 \ln X_{i,t} + \mu_t + \eta_i + \varepsilon_{i,t}$$

All variables are defined as above. The above model tests whether the effect of human and physical accumulation is enhanced in presence of remittances. A negative interaction term indicates that remittances effect on growth is magnified where capital accumulation is low. The opposite applies if a positive interaction term is found.

Indirect Effect

However, as highlighted in the literature review, remittances effect on economic growth may also be indirect. Indeed, as highlighted by Barajas et al. (2009), remittances, by easing financial restrictions, allow households to increase their accumulation of human and physical capital. Moreover, physical and human capital accumulation can be considered as channels through which remittances might influence growth. I therefore define two channel equations to estimate the impact of remittances on physical and human capital accumulation.

Following Ngoma and Ismail (2013), I estimate the effect of remittances on human capital accumulation as follows:

$$(13) \quad \ln s_{h_{i,t}} - \ln s_{h_{i,t-1}} = \beta_0 + \beta_1 \ln s_{h_{i,t-1}} + \beta_2 \ln rem_{i,t} + \beta_3 \ln X_{i,t} + \mu_t + \eta_i + \varepsilon_{i,t}$$

where $X_{i,t}$ is a set of control variables that consists of population size, education expenditure and gross domestic product. All other variables are defined as above.

Based on Griffith et al. (2010), I define the relationship between remittances and physical capital as follows:

$$(14) \quad \ln s_{k_{i,t}} - \ln s_{k_{i,t-1}} = \beta_0 + \beta_1 \ln s_{k_{i,t-1}} + \beta_2 \ln rem_{i,t} + \beta_3 \ln X_{i,t} + \mu_t + \eta_i + \varepsilon_{i,t}$$

where $X_{i,t}$ is a set of control variables that consists of gross domestic product, foreign direct investment and a proxy for private sector credit. All other variables are defined as above.

3.2 Remittances and Output Volatility

As remittances are stable and cyclical capital flows, one may expect them to impact output volatility. In order to test the stabilizing role of remittances the following model is used (Chami et al., 2012):

$$(15) \quad \text{Output Volatility} = \beta_0 + \beta_1 GDP_{i,t-1} + \beta_2 GDP_{i,t-1}^2 + \beta_3 \ln rem_{i,t} + \beta_4 X_{i,t} + \mu_t + \eta_i + \varepsilon_{i,t}$$

Where i denotes country, t denotes time, *Output Volatility* is measured as the standard deviation of real GDP per capita growth of the five previous time periods inclusive of the current year, $GDP_{i,t-1}$ is the relative initial income, $GDP_{i,t-1}^2$ is the relative initial income squared, Rem is remittances measured as a ratio of GDP and X_{it} is the matrix of control variables and μ_t is a time specific effect, η_i is an unobserved country-specific effect and ε_{it} is the error term.

As found by Chami et al. (2010), I expect β_3 to be negative, that is a diminishing output volatility with rising remittances. Output volatility is expected to decrease with initial income, $GDP_{i,t-1}$. This is supported by Koren and Tenreyo (2004) who found that as countries experience growth they tend to develop their production in less risky sectors.

Following the existing literature, the set of control variables will consist of six explanatory variables. I expect a positive coefficient for *Terms of Trade volatility* as well as for *Trade Openness*. As Easterly, Islam and Stiglitz (2000) document, higher trade openness causes economies to specialize and have product-specific growth. More integrated economies are thus more exposed to external shocks, increasing growth volatility. Moreover, Rodrik (1998) argues that *Government consumption* reduces risk as government purchases are relatively stable compared to the rest of the economy. I expect a positive coefficient for *financial development* and a positive one for *financial openness*. While there has been evidence that a more financially developed economy experiences less growth volatility, a more open financial system is more likely to be destabilized by other international markets and capital flows that tend to be more cyclical (Calballero, 2000; Easterly, Islam and Stiglitz, 2000). Finally, I expect *institutional quality* to have a negative effect on output growth volatility. A politically

stable economy tends to be less responsive to external shocks, reducing volatility (Rodrik, 1998).

3.3 Estimation Techniques

All the above specifications will first be estimated using pooled Ordinary Least Squared (OLS). To ensure the consistency of parameter estimation, it is important to avoid heteroscedasticity and autocorrelation in the residuals. Therefore, the regressions will be estimated using robust standard errors to assure the consistency of hypothesis testing. White standard errors will therefore be used. The latter are robust to serial correlation within cross-section and changing variances over time. However, those Robust Standard Errors do not correct for cross-sectional correlation.

Moreover, endogeneity resulting from omitted variables could result to an inconsistent OLS estimator. This can be partially addressed using a fixed effect model. Therefore the second method that I use is therefore an OLS panel regression with cross-section fixed effects. The use of cross-section fixed effects reflects significant differences between countries and will allow to control for country-specific factors that affect the growth rate of an economy. As such, it is appropriate to allow for separate intercepts and introduce cross section dummy variables as supported by the results of the redundant fixed effects test. I also estimate the equations using cross section random effects (RE). However, the Hausman test concludes that fixed effects models are preferred. Therefore, only fixed effects results are reported.

4. Data

4.1 Data Sources

Most of the data was obtained from the World Bank World Development Indicators database. The institution indicator is sourced from the PolityIV database developed by the The Center for Systemic Peace. Physical capital accumulation is measured as the share of real investment in GDP and human capital accumulation as the secondary school enrolment rate. Table 8 in the appendix summarizes definitions and sources of all variables.

As mentioned before, the growth rate per capita is measured by the first difference of real GDP per capita and Output Volatility by the standard deviation of real GDP per capita growth of the five previous time periods inclusive of the current year.

It is important to note that the measure of remittances does not include those sent through informal channel such as cash transfers or payments in the form of goods or services.

4.1.1 Control Variables

To account for the role of government, the level of final government consumption as a percentage of GDP is used. To measure openness to trade I employ the sum of exports and imports as a percentage to GDP. The higher is the value, the more open is the economy. Due to data availability, I choose to proxy financial openness by net foreign direct investment inflows as a percentage of GDP as proposed by Bugamelli and Paterno (2008). Largely accepted by the literature, I will use M2/GDP to proxy for financial development. As highlighted by Guiliano and Ruiz-Arranz (2009), it is “the broadest measure of financial intermediation and includes three types of financial institutions: the central bank, deposit money banks and other financial institutions”. Finally, terms of trade volatility are computed as the standard deviation of the ratio of export value index over the import value index as shown below:

$$Terms\ of\ Trade_{i,t} = \frac{Export\ Value\ Index_{i,t}}{Import\ Value\ Index_{i,t}}$$

All the control variables are expressed in logs except for government consumption and financial development.

4.2 Descriptive Statistics

A summary of descriptive statistics of all the variables used is available in the appendix Table 9. Remittances represent on average 3.63 percent of the GDP over the sample and Lesotho is the country with the highest share of remittances, in 1982 it peaked at 106.48%. This can be explained by the fact that Lesotho highly depends on migration and remittance flows as it is one of the poorest country in the world.

Region	1980	1985	1990	1995	2000	2005	2010	2014
East Asia and Pacific	2.36	4.25	7.84	15.10	24.71	35.60	65.16	87.69
Europe and Central Asia	19.15	14.84	34.46	43.84	51.38	83.99	124.83	157.12
Latin America and Caribbean	1.82	2.53	5.74	13.42	19.77	48.09	55.08	62.80
Middle East and North Africa	6.53	6.43	10.48	12.81	11.93	17.68	31.02	41.48
North America	0.08	0.08	1.17	2.18	4.40	5.71	7.15	8.09
South Asia	1.32	5.80	5.57	10.00	17.20	34.23	81.62	115.26
Sub-Saharan Africa	1.30	1.12	1.73	3.07	4.75	19.92	29.21	33.34
Sample	36.79	35.31	67.75	102.19	134.50	245.95	395.95	508.74

Table 1: Remittances (in billion dollars), Source: World Bank and own calculations

Region	1980	1985	1990	1995	2000	2005	2010	2014
East Asia and Pacific	2.29	4.82	3.00	1.48	2.45	4.22	3.44	3.54
Europe and Central Asia	1.44	1.22	0.96	1.31	2.52	3.95	4.13	4.40
Latin America and Caribbean	1.65	2.25	2.70	3.07	3.61	5.13	4.74	4.59
Middle East and North Africa	5.88	5.20	6.78	6.94	5.93	4.32	4.03	4.80
North America	0.00	0.00	0.02	0.03	0.04	0.06	0.06	0.05
South Asia	3.93	4.08	3.30	3.04	3.40	7.25	7.91	9.66
Sub-Saharan Africa	4.00	4.91	4.02	3.09	3.53	3.65	3.49	3.21
Sample	2.95	3.52	3.21	2.76	3.25	4.24	4.20	4.36

Table 2: Remittances (as a percentage of GDP), Source: World Bank and own calculations

Tables 1 and 2 report the flows of remittances for the entire sample and the six regions: East Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, North America, South Asia and Sub-Saharan Africa in nominal terms and as a percentage of GDP. Between 1980 and 2014, remittances dramatically rose from \$37 billion to \$509 billion in 2014 for the entire sample. Their share in GDP increased considerably as well, it went from 2.95 percent in 1980 to 4.36 percent in 2014. It is important to highlight the sharp increase in the flows in the 90's. The latest can be attributed to soaring migration flows and technological developments in the banking sector, allowing transaction costs to decrease and geographical reach to rise (Chami et al. 2005). It is also important to keep in mind that this sharp increase could partly be explained by the larger use of formal channels, thus raising the amount of recorded flows. There is however a slight drop in the evolution of remittances as a percentage of GDP. This can easily be explained by the financial crisis of 2008 where due to their own income uncertainty, remitters may have sent less transfer flows. Strikingly, in nominal terms, the European and Central Asian region received 30% of

the flows in 2014. This is confirmed by the Top 20 receiving economies where countries such as France, Germany, Belgium and Italy appear (Figure 2).

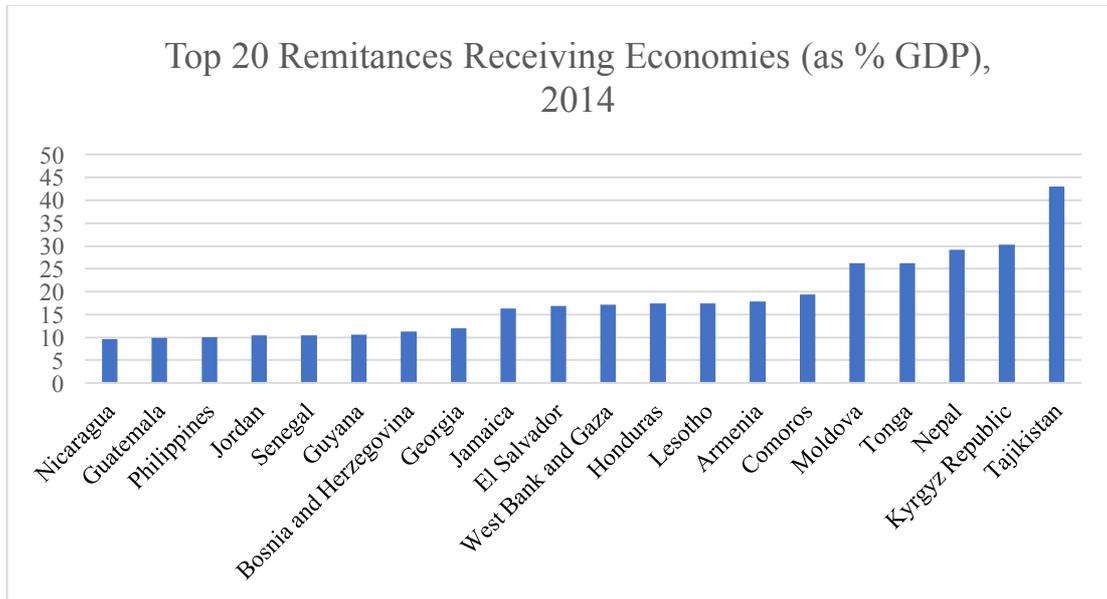


Figure 1: Top 20, remittances receiving economies (as a percentage of GDP), Source: World Bank

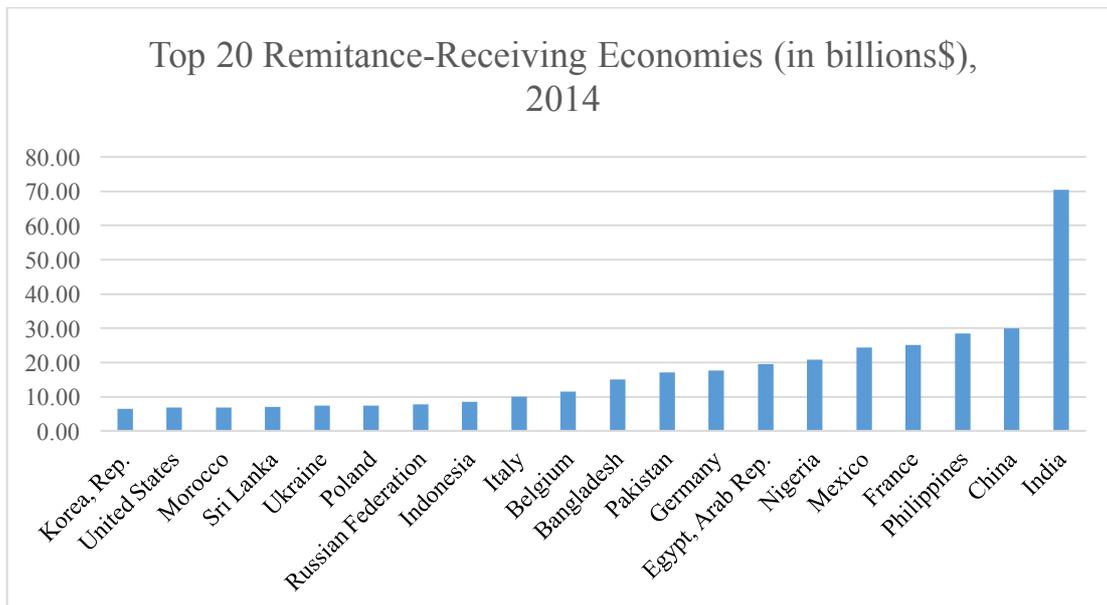


Figure 2: Top 20, remittances receiving economies (in billion dollars), Source: World Bank

Moreover, it is interesting to compare remittance flows to other capital flows such as official development aid (ODA) and foreign direct investment (FDI). Figure 3 shows that ODA flows have experienced a downward trend over the sample period, reflecting a transition in the economic situation of donor countries. Remittances flows have increased relatively steadily. Over the period considered, FDI inflows have expanded

but have also sharply decreased during the financial crisis of 2008 while remittances flows remained stable and kept rising.

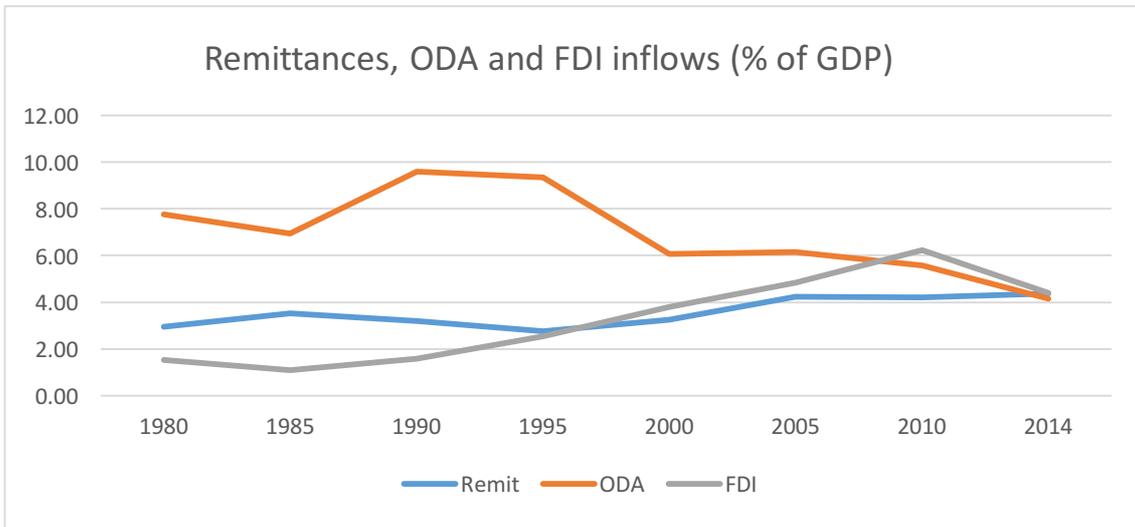


Figure 3: Remittances, ODA, FDI inflows (as a percentage of GDP), Source: World Bank and own calculations

5. Results

5.1 Remittances and Economic Growth

Direct Effect

Results of both pooled OLS and cross-section fixed effects for equations (10), (11) and (12) are reported on Tables 3 and 4. Column I and V introduce equation (10), the benchmark model as defined by Mankiw, Romer and Weil (1992). All estimated coefficients are significant for both OLS and FE models, except $\ln(n + g + \delta)$, the population growth variable in column I. In line with Mankiw, Romer and Weil (1992), all variables show their expected sign but the model is better explained with FE estimations as reflected by their higher r-squared. As predicted both physical and human capital accumulation positively impact economic growth. The FE estimators are however higher. Economic growth per capita increases by 0.043 and 0.021 percent with a one percent increase in physical capital accumulation and human capital, respectively. As supported by the Solow Model above, higher saving rates lead to economic expansion. The population growth variable while insignificant using pooled OLS, is significant and negative using FE. As expected by Solow model predictions, rises in population growth lowers economic growth per capita. In the fixed effects estimation,

a one percent increase in population growth reduces growth per capita by 0.005 percent. Furthermore, the highly significant negative coefficient of the lagged GDP per capita variable, in both pooled OLS and FE, shows evidence of income convergence. Indeed, a lower income per capita in the previous time period is associated with higher growth per capita in the following period. Poorer countries thus experience higher growth rates and that of richer countries is lower.

Columns II and VI show results for the benchmark specification augmented by a remittance term as illustrated in equation (11). Control variables are added in the estimations of columns III and VII. All variables used for the benchmark model have the same effects in all other specifications and the estimated coefficients can thus be interpreted as previously. The coefficient for remittances is positive and highly significant for FE only. When controls variables are not included, a one percent increase in remittances positively impact economic growth per capita by 0.004 percent (column VI). Remittances would therefore have a direct effect on economic growth, even if low in magnitude. It is interesting to observe that the influence of physical capital accumulation on growth slightly rises when remittances are included. But human capital accumulation and population effect on growth dampen when remittances are present.

Furthermore, when including control variables, the coefficient for remittances decreases slightly while remaining positive and significant for FE. Direct effect of remittances on growth thus lowers from 0.004 to 0.002 percent. Strikingly, the impact of physical capital accumulation decreases while the human capital accumulation effect stays constant. Both variables remain highly significant. This drop in the magnitude of physical capital accumulation could be attributed to the introduction of the FDI variable.

To test the robustness and sensitivity of those results, I split the sample according to four income levels: low, lower middle, upper middle and high. This classification is based on the World Bank categorization of countries. Table 10 in the appendix shows the results of equation (11) across the different samples. The positive and significant coefficients of remittances for lower middle and high income countries corroborates

with the previous results. Strangely, the magnitude of the effect remittances have is similar for both sub-samples.

Enhancing Effect of Remittances

Columns IV and VIII of Tables 3 and 4 show the estimated results according to equation (12). This specification allows for analysis of potential enhancing effect remittances have on growth per capita through physical and human capital accumulation.

The impact of both physical and human capital accumulation is, as predicted, positive and significant. Interacting remittances with physical capital accumulation provides highly significant negative coefficients. Those terms suggest that remittances boost per capita growth where the levels of physical capital accumulation are low. Furthermore, the only significant interaction term involving remittances and human accumulation is negative. This is true when observing estimation results employing pooled OLS. This further supports the enhancing effect of remittances on economic growth when investment in human capital is small. The coefficient for remittances is positive and significant only when using pooled OLS. However, as OLS does not correct for endogeneity problems, those estimates may be inconsistent and should be taken with precaution.

However, when splitting the sample into the different income levels, as done above, to verify for the sensitivity of the results, remittances coefficient is positive and significant for upper middle and high income countries (Table 11, see appendix). Surprisingly, remittances effect on economic growth per capita is larger in high income countries than upper middle income ones. The interaction between human capital accumulation and remittances is negative and significant for high income countries only. This demonstrate that the results for the enhancing effects are not robust and depend on the different levels of income.

Table 3: Remittances and Economic Growth Results - Pooled OLS

Dependent Variable: Growth per Capita	Pooled OLS			
	I	II	III	IV
Constant	-0.026*** (0.008)	-0.026*** (0.008)	-0.009 (0.009)	-0.007 (0.009)
Ln (GDP per capita_{t-1})	-0.006*** (0.002)	-0.006*** (0.002)	-0.005* (0.003)	-0.007** (0.003)
Ln (Physical Capital Accumulation)	0.032*** (0.005)	0.035*** (0.005)	0.032*** (0.005)	0.032*** (0.005)
Ln (Human Capital Accumulation)	0.007** (0.003)	0.008** (0.004)	0.007 (0.004)	0.008* (0.004)
Ln (n + g + δ)	-0.001 (0.001)	-0.002 (0.002)	-0.003** (0.001)	-0.003** (0.001)
Ln (Remittances)		6.25 E-0.5 (0.0008)	-0.0002 (0.001)	0.021*** (0.005)
Ln (Remittances)*Ln (Physical Capital Accumulation)				-0.009*** (0.003)
Ln (Remittances)*Ln (Human Capital Accumulation)				-0.005** (0.002)
Ln (Financial Development)			-0.001 (0.003)	-0.001 (0.002)
Ln (Government)			-0.015*** (0.004)	-0.015*** (0.004)
Ln (FDI)			0.001*** (0.0004)	0.001*** (0.0003)
Ln (Openness to trade)			0.001 (0.003)	0.002 (0.002)
R²	0.077	0.104	0.126	0.137
Observations	2623	2450	1886	1886

*significant at 10%, ** significant at 5%, *** significant at 1%

Note: Robust standard errors are in parentheses

Table 4: Remittances and Economic Growth – Fixed Effects

Dependent Variable: Growth per Capita	Fixed Effects			
	V	VI	VII	VIII
Constant	0.059** (0.025)	0.058*** (0.013)	0.097*** (0.018)	0.107*** (0.025)
Ln (GDP per capita_{t-1})	-0.037*** (0.008)	-0.035*** (0.004)	-0.041*** (0.005)	-0.043*** (0.008)
Ln (Physical Capital Accumulation)	0.043*** (0.004)	0.044*** (0.004)	0.030*** (0.005)	0.031*** (0.005)
Ln (Human Capital Accumulation)	0.021*** (0.004)	0.016*** (0.004)	0.016*** (0.004)	0.016*** (0.006)
Ln (n + g + δ)	-0.005** (0.002)	-0.004 (0.002)	-0.004 (0.002)	-0.004 (0.002)
Ln (Remittances)		0.004*** (0.001)	0.002** (0.001)	0.011 (0.007)
Ln (Remittances)*Ln (Physical Capital Accumulation)				-0.012*** (0.005)
Ln (Remittances)*Ln (Human Capital Accumulation)				0.005 (0.004)
Ln (Financial Development)			-0.004 (0.003)	-0.003 (0.004)
Ln (Government)			-0.012*** (0.003)	-0.031*** (0.008)
Ln (FDI)			0.001*** (0.043)	0.001*** (0.0003)
Ln (Openness to trade)			0.0223*** (0.005)	0.0211*** (0.005)
R²	0.256	0.256	0.292	0.292
Observations	2623	2450	1886	1886

*significant at 10%, ** significant at 5%, *** significant at 1%
Note: Robust standard errors are in parentheses

5.2 Physical and Human Capital Accumulation as Channels

Regression results using cross-section fixed effects for the channel equations (13) and (14) can be found below in Tables 5 and 6. Interestingly, both specifications show signs of capital accumulation convergence. This is supported by the highly significant and negative lagged physical and human capital accumulation coefficients. Investments in human and physical capital are stronger where previous saving rates were lower. When analysing whether remittances are channelled through physical and human capital accumulation, remittance coefficients are significant and positive. Those estimations, even low in magnitude, let us assume that remittances increase both physical and human

capital accumulation. Remittances, by providing an alternative source of capital, release financial constraints on households that are now able to increase investments in human and physical capital. This is confirmed by Barajas et al. (2009) who also find that remittances by diversifying income sources allow households to invest more.

Chami et al. (2005), explain that when remittances are used for consumption purposes, there occurs a negative effect on long-term growth. According to them, remittances would then be compensatory in nature and received by households with high marginal propensity to consume, leading to an improvement on household's welfare but not on economic growth. However, the above results showed that remittances had a positive impact on economic growth. The estimated channel equations help us confirm that remittance flows boost savings or investment in education. Guiliano and Arranz (2009) explain that this positive effect is possibly due to migrants searching to invest in their country of origin when in a beneficial economic situation.

Furthermore, when splitting the sample into four income groups, the results remain robust (Tables 12 and 13, see appendix). I found a significant and positive effect of remittances on human capital accumulation in upper middle income countries and on physical capital accumulation in lower middle income countries. Those results are in line with the ones found in Table 11 where remittances had a positive impact on growth per capita in upper middle and high income countries. This confirms that remittances are opportunistic capital flows in nature. Remittances thus increase investments whether it is because migrants search to invest in their countries of origin or if it is due to relaxed financial restrictions allowing households to invest in human or physical capital.

Table 5: Human Capital Accumulation Channel Equation - Results

Dependent Variable: Human Capital Accumulation	Fixed Effects
Constant	-0.608*** (0.142)
Ln (Human Capital Accumulation_{t-1})	-0.073*** (0.011)
Ln (Remittances)	0.003* (0.001)
Ln (Population Size)	0.105*** (0.022)
Ln (Education Expenditure)	0.001 (0.004)
Ln (Real GDP per capita)	-0.006 (0.014)
R²	0.189
Observations	2410

*significant at 10%, ** significant at 5%, *** significant at 1%

Note: Robust standard errors are in parentheses

Table 6: Physical Capital Accumulation Channel Equation - Results

Dependent Variable: Physical Capital Accumulation	Fixed Effects
Constant	0.382*** (0.102)
Ln (Physical Capital Accumulation_{t-1})	-0.309*** (0.052)
Ln (real GDP per Capita)	0.001 (0.025)
Ln (Remittances)	0.009* (0.005)
Ln (FDI)	0.026*** (0.005)
Ln (Private Sector Credit)	0.003 (0.014)
R²	0.172
Observations	3290

*significant at 10%, ** significant at 5%, *** significant at 1%

Note: Robust standard errors are in parentheses

5.3 Output Volatility

Remittances can also be used by households to smooth their consumption in presence of business cycles. This would mean that remittances are used for consumption and are compensatory in nature. Results of cross-section fixed effects regressions analysing the effect of remittances on per capita output volatility can be found in Table 7. Column I shows results for equation (15).

Remittances hold a negative but insignificant coefficient and I cannot conclude that remittances act as stabilizer over business cycles. This finding is not in line with Chami et al. (2012) who found a negative effect of remittances on output growth volatility. I therefore cannot conclude that remittances are stabilizing and help support consumption stability over business cycles. However, De et al. (2016) also have inconclusive results which they attribute to the importance of the motives behind remitting. The positive impact of remittances on capital accumulation found above leads us to believe that remittances are used for investment opportunities and not for consumption smoothing purposes. The disparities between countries and regions might be a reason for this insignificant coefficient. Indeed, developing countries may be more inclined than developed countries to use remittances to smooth their income in case of a financial crisis or a natural disaster.

However, when splitting the sample into four income level subsamples, this is not verified (Table 14, see appendix). I found a significant and positive remittances coefficient for low income countries while the coefficients for the other income levels are insignificant. Remittances in low income countries are thus not acting as stabilizers as one would expect but are rather a transmission source of business cycles. Thus, remittances do not act as a consumption smoothing tool in lower middle, upper middle and high income countries but could act as business cycles transmission channel in low income countries. Those results reassure the idea that, except for low income countries, remittances are used for investing rather than consumption smoothing. This is supported by the results in tables 12 and 13 in the appendix. While not all coefficients for remittances are significant, I find a positive effect of remittances on human capital accumulation for upper middle income economies and on physical capital accumulation in lower middle ones.

Table 7: Output Volatility per Capita - Fixed Effects

Dependent Variable: Output Volatility per Capita	
Constant	0.376** (0.175)
Ln (GDP per capita_{t-1})	-0.175** (0.022)
Ln (GDP per capita_{t-1})²	0.021*** (0.010)
Ln (Remittances)	-0.0003 (0.001)
Ln (Terms of Trade Volatility)	0.005*** (0.001)
Ln (Trade Openness)	-0.013 (0.036)
Ln (Government)	0.070 (0.151)
Institution	-4.54E-05** (2.02E-0.5)
Ln (Financial Development)	0.006 (0.004)
Ln (Financial Openness)	0.0004 (0.001)
R²	0.384
Observations	1934

*significant at 10%, ** significant at 5%, *** significant at 1%

Note: Robust standard errors are in parentheses

6. Conclusion

Using a sample of 129 countries for the 1980-2014 period and an Augmented Solow Model theoretical framework, this paper investigated the impact remittances have on growth as well as on two growth determinants, physical and human capital accumulation. In addition, I also analysed the effect remittances have on output volatility.

Results showed that remittances had a direct positive impact on economic growth. Contradictory to the findings of Chami et al. (2005), I concluded that remittances were in fact acting as a source of capital for economic development and that those transfer flows were used for investments. Interestingly when analysing separately the effect of remittances on both human and physical capital accumulation, the impact was positive. This supported the idea that remittance flows allow individuals to invest in savings and education by relaxing their financial restrictions. In addition, I found evidence that the effect of remittances on economic growth was more effective where the level of physical and human capital accumulation was low. Furthermore, one could ask if remittances are used to smooth consumption. The insignificant effect of remittances on output volatility suggests that individuals do not use remittances to counterbalance the effect of business cycles. All those findings lead to believe that overall remittances are not compensatory in nature but are rather used by migrants as a way to invest back home or finance the education of family members left behind.

Following those results, governments should implement policies that encourage migrants to send more remittances by lowering the cost of sending those transfers for example. In addition, policymakers could implement policies that maximize the positive effect of remittances. Furthermore, as remittances appear to have more effect where human and physical capital accumulation are low, remittances could be an important tool to boost the economy in developing countries. As highlighted by Ratha (2013) in a policy brief, linking remittances to financial access could insensitive households to save for a potential future hardship or invest in a business. Indeed, it has been shown that remittance-receiving individuals are more likely to have bank accounts. Governments could increase access to credit or health insurance by taking

remittance flows into account as a source of capital and as a criterion for access to such services.

Finally, the literature has still a lot to cover when it comes to remittances and its potential benefits or disadvantages. Brain drain for example is a phenomenon of migration as well. It could be interesting to analyse whether remittances can counterbalance the loss of an economy due to brain drain. Remittances are inflows coming into a country and as shown in this thesis, they have a positive impact on economic growth and savings as well as on investments in education. However, the migrants sending those transfer flows may be educated and constitute an economic loss for their country of origin. Therefore, analysing whether the loss due to brain drain is counterbalanced by the gain in savings and investment in education due to remittances inflows can be relevant. In addition, analysing whether rich households are the ones sending their family members abroad or whether low income households are more inclined to receive remittances would allow to study the relationship between remittances and inequality.

7. Bibliography

Acosta,P. Calderon,C. Fajnzylber,P. Lopez,H. (2006) 'Remittances and Development in Latin America', *The World Economy*, Vol.29, no. 7, pp. 957-987.

Adams, R.H. Cuecuecha, A. (2013) 'The Impact of Remittances on Investment and Poverty in Ghana', *World Development*, Vol.50, pp. 24-40.

Agarwal,R. Horowitz, A.W. (2002) 'Are International Remittances Altruism or Insurance? Evidence from Guyana using Multiple-Migrant Households', *World Development*, Vol.30, pp. 2033-2044.

Aggarwal, R. Demirguc-Kunt, A. Martinez Peria, M.S. (2011) 'Do Remittances Promote Financial Development?', *Journal of Development Economics*, Vol.96, pp. 255-264.

Balasubramanyam, V. N., M. Salisu, and David Sapsford, (1996) 'Foreign Direct Investment and Growth in EP and IS Countries,' *Economic Journal* 106 (1996):92–105.

Barajas, A. Chami, R. Fullemkamp, C. Gapen, M. Montiel, P. (2009) 'Do Workers' Remittances Promote Economic Growth?', *International Monetary Fund, Working Paper no. 09/153, IMF*.

Barro,R.J. and Redlick, C.J., (2009) 'Macroeconomic Effects from Government Purchases and Taxes' (NBER Working Paper no. 15369, September 2009).

Barro, R.J. and X. Sala-i-Martin, 1992, "Public Finance in Models of Economic Growth," *Review of Economic Studies*, 54: 646-61.

Bettin, G., Lucchetti, R., Zazzaro, A., 2012. "Financial development and remittances: Micro-econometric evidence," *Economics Letters*, Elsevier, vol. 115(2), pages 184-186.

Bugamelli, M. Paterni, F. (2008) 'Output growth volatility and remittances', Temi di discussione (Economic working papers) 673, Bank of Italy, Economic Research and International Relations Area.

Caballerro, Ricardo (2000) 'Macroeconomic Volatility in Latin America: A conceptual Framework and Three Case Studies', *Economia*, pp. 31 - 107

Chami, R. Hakura, D. Montiel, P. (2009) 'Remittances: An Automatic Output Stabilizer?', International Monetary Fund, Working Paper no. 09/91., IMF.

Chami, R. Barajas, A. Cosimano, T. Fullenkamp, C. Gapen, M. Montiel, P. (2008) 'Macroeconomic Consequences of Remittances', IMF Occasional Paper No. 259 (Washington: International Monetary Fund)

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

Cooray, A. (2012) 'The Impact of Migrant Remittances on Economic Growth: Evidence from South Asia', *Review of International Economics*, Vol.20, no. 5, pp. 985–998.

De, S., Islamaj, E., Kose, M.A., Ratha, D. Yousefi, S.R. (2015) 'Can Remittances Help Promote Consumption Stability?', *Global Economic Prospects 2015*, pp. 175-181.

Easterly, W. Islam, R. and Stiglitz, J. (2000) 'Explaining Growth Volatility', World Bank, Mimeo

Elbadawi, I. A. and Rocha, R. (1992), 'Determinants of Expatriate Workers' Remittances in North Africa and Europe', Working Paper WPS 1038, Country Economics Department, The World Bank, Washington, DC.

El-Sakka, M. I. T. and McNabb, R. (1999), 'The Macroeconomic Determinants of Emigrant Remittances', *World Development* 27(8): 1493-1502.

Fayissa,B., Nsiah, C., (2010) 'Can Remittances Spur Economic Growth and Development? Evidence from Latin American Countries (LACs)', Working Papers 201006, Middle Tennessee State University, Department of Economics and Finance.

Garcia-Fuentes P.A. Kennedy P.L. (2009) 'Remittances and Economic Growth in Latin America and the Caribbean: The Impact of Human Capital Development', Annual Meeting, January 31-February 3, 2009, Atlanta, Georgia 46751, Southern Agricultural Economics Association.

Griffith, R., Boucher, T., & McCaskie, P. (2008), 'Remittances and Their Effect on the Level of Investment in Barbados', *The Journal of Public Policy Analysis*, 2, pp. 3-15.

Guha, P. (2013) 'Macroeconomic Effects of International Remittances: The Case of Developing Economies', *Economic Modelling*, Vol.33, pp. 292-305.

Guiliano, P. Ruiz-Arranz, M. (2009) 'Remittances, financial development, and Growth', *Journal of Development Economics*, Vol.90, no. 1, pp. 144-152.

Johnson,G.E. Whitelaw, W.E (1974) 'Urban-Rural Income Transfers In Kenya: An Estimated-Remittances Function', *Economic Development and Cultural Change*, Vol.22, pp. 473-479.

Koren, M. and Tenreyro, S. (2004) 'Diversification and Development', Mimeo

Mankiw, N.G. Romer, D. and Weil,D. (1992), "A Contribution to the Empirics of Economic Growth," *Quarterly Journal of Economics* 107 :407-37.

Mundaca, B.G. (2009) 'Remittances, Financial Market Development, and Economic Growth: The Case of Latin America and the Caribbean', *Review of Development Economics*, Vol.13, no. 2, pp. 288 - 303.

Ngoma, A. Ismail, N. (2013), 'The Impact of Brain Drain on Human Capital in Developing Countries', *South African Journal of Economics*, Vol.81, issue 2, pp. 211-224.

Poirine, B. (1997), 'A Theory of Remittances as an Implicit Family Loan Arrangement,' *World Development*, Vol. 25, pp. 589-611.

Ratha, D. (2013), "The impact of Remittances on Economic Growth and Poverty Reduction", Washington DC: Migration Policy Institute

Rodrik, D. (1998), "Why Do More Open Economies Have Bigger Governments?" *Journal of Political Economy*, Vol. 106, No. 5, pp. 997 – 1032.

Solow, R. (1956), "A Contribution to the Theory of Economic Growth", *The Quarterly Journal of Economics*, Vol. 70, No. 1., pp. 65-94.

Stark, O. (1978) 'Economic-Demographic Interaction in Agricultural Development: The Case of Rural-to-Urban Migration', Rome: UN Food and Agriculture Organization.

Stark, O. Bloom, D.E (1985) 'The new Economics of Labor Migration', *The American Economic Review*, Vol.75, no. 2, pp. 173-178.

Stark, O. Lucas, R.E.B (1985) 'Motivations to Remit: Evidence from Botswana', *Journal of Political Economy*, Vol.93, no. 5, pp. 901-918.

World Bank Group, (2016) *Migration and Remittances Factbook 2016*, Third Edition. Washington, DC: World Bank.

8. Appendix

Table 8: Variables Definition, Source: World Bank

Variable	Definition	Source
Real GDP per capita	GDP is the sum of gross value added by all resident producers in the economy plus any taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2010 U.S dollars.	World Development Indicators
Real GDP per capita growth	Annual percentage growth rate of GDP per capita based on constant local currency. Aggregates are based on constant 2010 U.S. Dollars. GDP per capita is gross domestic product divided by midyear population.	World Development Indicators
Remittances	Level of personal remittances received as a percentage of GDP. Data are the sum of two items defined in the sixth edition of the IMF's Balance of Payments Manual: Personal Transfers and compensation of employees.	World Development Indicators
Physical Capital Accumulation	Gross capital formation as a percentage of GDP consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories.	World Development Indicators
Population growth	Annual population growth rate for year t is the exponential rate of growth of midyear population from year t-1 to t, expressed as a percentage. Population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship - except for refugees not permanently settled in the country of asylum, who are generally considered part of the population of the country of origin.	World Development Indicators
Human Capital Accumulation	Total enrolment in secondary education, regardless of age, expressed as a percentage of the population of official secondary education age. GER can exceed 100% due to the inclusion of over-aged and under-aged students because of early or late school entrance and grade repetition.	World Development Indicators
Government	The level of general government final consumption expenditure as a percentage of GDP. It includes all government current expenditures for purchases of goods and services as well as most expenditures on national defense and security, but excludes government military expenditures that are part of government capital formation	World Development Indicators
Institutional Quality	Polity Stability Index measured by the Polity Score. The Polity Score captures this regime authority spectrum on a 21-point scale ranging from -10 (Hereditary monarchy) to +10 (consolidated democracy).	The Center for Systemic Peace
Openness to Trade	The level of trade as a percentage of GDP. Trade is the sum of exports and imports of goods and services measures as a share of gross domestic product.	World Development Indicators
Financial Openness	Level of Foreign direct investment measures as the net inflows of investment to acquire a lasting management interest in an enterprise operating in an economy other than that of the investor. It is the sum of earnings, other long-term capital and short-term capital as shown in the balance of payments. This series shows net inflows in the reporting economy from foreign investors and is divided by GDP.	World Development Indicators
Financial Development	Level of money and quasi money (M2) as a percentage of GDP. Money and Quasi money comprise the sum of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of resident sectors other than the central government.	World Development Indicators
Export Value Index	Export values indexes are the current value of exports converted to U.S dollars and expressed as a percentage of the average for the base period (2000).	World Development Indicators
Import Value Index	Import value indexes are the current value of imports converted to U.S. Dollars and expressed as a percentage of the average for the base period (2000).	World Development Indicators

Table 9: Summary Descriptive Statistics

Variable	Mean	Median	Max Value	Min Value	Std. Dev.	Obs
GDP per capita	10,054.84	3,507.93	1,100,001.10	130.44	15,296.33	5104
Remittances (%GDP)	3.63	1.17	106.48	0.00	74,697.00	4356
Trade Openness	78.12	70.12	374.15	6.32	40.43	5013
Education	69.93	78.40	163.10	2.99	32.82	3618
Investment (%GDP)	23.03	22.03	74.82	-2.42	8.46	4995
Government Expenditure (%GDP)	16.39	16.08	69.54	0	6.30	4942
Population Growth	1.52	1.51	11.18	-6.34	1.32	5504
Financial Development	46.83	38.24	251.25	0.83	32.64	4367
Institution	0.62	6.00	10.00	-88.00	15.47	4667
Growth per Capita	1.82	2.08	92.36	-47.72	5.24	5099
Consumption (%GDP)	66.89	65.60	190.56	10.89	15.66	4919
Output Volatility	3.36	2.51	35.88	0.14	2.88	4906
Financial Openness	3.51	1.75	255.42	-79.74	8.10	4908
Terms of Trade Volatility	0.16	0.11	5.03	0.00	0.22	4040

Table 10: Remittances and Economic Growth – Fixed Effects – Robustness Check

Dependent Variable: Growth	Income Level			
	Low	Lower Middle	Upper Middle	High
Constant	0.313 (0.226)	0.145** (0.072)	0.148*** (0.077)	0.044 (0.133)
Ln (GDP per capita_{t-1})	-0.052 (0.040)	-0.045*** (0.013)	-0.049*** (0.016)	-0.036 (0.011)
Ln (Physical Capital Accumulation)	0.031*** (0.009)	0.030*** (0.012)	0.065*** (0.007)	0.038*** (0.013)
Ln (Human Capital Accumulation)	0.022*** (0.008)	0.032*** (0.012)	-0.012 (0.014)	0.006*** (0.017)
Ln (n + g + δ)	-0.006 (0.012)	-0.019* (0.012)	-0.017*** (0.005)	-0.002 (0.003)
Ln (Remittances)	-0.0022 (0.002)	0.005*** (0.003)	0.001 (0.001)	0.005** (0.002)
Ln (Financial Development)	-0.001 (0.007)	-0.019 (0.013)	0.008 (0.010)	-0.020** (0.008)
Ln (Government)	1.020 (0.868)	0.257 (0.200)	0.476** (0.239)	0.138 (0.241)
Ln (FDI)	0.002 (0.002)	-0.001 (0.002)	-0.002 (0.001)	-0.004*** (0.001)
Ln (Openness to trade)	-0.263 (0.213)	-0.056 (0.066)	-0.082 (0.060)	-0.015 (0.065)
R²	0.256	0.349	0.323	0.417
Observations	242	433	574	401

*significant at 10%, ** significant at 5%, *** significant at 1%
Note: Robust standard errors are in parentheses

Table 11: Remittances and Economic Growth – Fixed Effects – Robustness Check

Dependent Variable: Growth	Income Level			
	Low	Lower Middle	Upper Middle	High
Constant	0.132 (0.109)	0.106*** (0.041)	0.133*** (0.052)	0.264*** (0.080)
Ln (GDP per capita_{t-1})	-0.052 (0.039)	-0.045*** (0.012)	-0.066*** (0.020)	-0.046*** (0.009)
Ln (Physical Capital Accumulation)	0.032*** (0.010)	0.019** (0.008)	0.056*** (0.010)	0.027* (0.016)
Ln (Human Capital Accumulation)	0.025*** (0.010)	0.024*** (0.009)	0.008 (0.017)	-0.016 (0.019)
Ln (n + g + δ)	0.009 (0.012)	-0.009 (0.011)	-0.011** (0.005)	-0.002 (0.003)
Ln (Remittances)	0.022 (0.021)	-0.005 (0.010)	0.036* (0.020)	0.070** (0.034)
Ln (Remittances)*Ln (Physical Capital Accumulation)	-0.018 (0.017)	-0.005 (0.005)	-0.007 (0.010)	-0.003 (0.011)
Ln (Remittances)*Ln (Human Capital Accumulation)	-0.001 (0.008)	0.009 (0.007)	-0.014 (0.012)	-0.031* (0.016)
Ln (Financial Development)	-0.002 (0.005)	-0.006 (0.011)	0.019* (0.001)	-0.002 (0.008)
Ln (Government)	-0.005 (0.016)	-0.032*** (0.011)	-0.038** (0.017)	-0.052** (0.023)
Ln (FDI)	0.0003 (0.001)	0.001 (0.001)	0.001** (0.001)	0.002*** (0.001)
Ln (Openness to trade)	-0.020 (0.021)	0.025*** (0.009)	0.032*** (0.011)	0.009 (0.011)
R²	0.258	0.330	0.313	0.412
Observations	248	545	616	440

*significant at 10%, ** significant at 5%, *** significant at 1%
Note: Robust standard errors are in parentheses

Table 12: Remittances and Human Capital Accumulation– Fixed Effects – Robustness Check

Dependent Variable: Human Capital Accumulation Growth	Income Levels			
	Low	Lower Middle	Upper Middle	High
Constant	-1.818*** (0.386)	-0.046*** (0.012)	-0.087 (0.128)	0.026 (0.137)
Ln (Human Capital Accumulation_{t-1})	-0.116*** (0.030)	-0.074*** (0.015)	-0.094*** (0.018)	-0.130*** (0.021)
Ln (Remittances)	0.002 (0.007)	0.001 (0.002)	0.004** (0.002)	-0.0001 (0.002)
Ln (Population Size)	0.267*** (0.060)	0.062*** (0.020)	0.016 (0.021)	0.034 (0.023)
Ln (Education Expenditure)	-0.0004 (0.018)	0.008* (0.004)	0.018* (0.010)	0.010** (0.005)
Ln (GDP)	0.008 (0.019)	0.006 (0.006)	-0.003 (0.010)	-0.009 (0.006)
R²	0.316	0.164	0.208	0.157
Observations	261	531	638	942

*significant at 10%, ** significant at 5%, *** significant at 1%
Note: Robust standard errors are in parentheses

Table 13: Remittances and Physical Capital Accumulation– Fixed Effects – Robustness Check

Dependent Variable: Physical Capital Accumulation Growth	Income Levels			
	Low	Lower Middle	Upper Middle	High
Constant	0.169 (0.255)	0.459*** (0.150)	0.368*** (0.126)	0.379*** (0.121)
Ln (Physical Capital Accumulation_{t-1})	-0.306*** (0.092)	-0.264*** (0.036)	-0.462*** (0.096)	-0.205*** (0.023)
Ln (real GDP per Capita)	0.047 (0.099)	-0.044 (0.046)	0.071 (0.066)	-0.013 (0.028)
Ln (Remittances)	-0.016 (0.015)	0.009* (0.006)	0.005 (0.009)	5.34E-05 (0.006)
Ln (FDI)	0.054*** (0.017)	0.030*** (0.009)	0.019** (0.009)	0.007 (0.004)
Ln (Private Sector Credit)	0.078 (0.051)	0.028 (0.029)	-0.014 (0.041)	-0.023* (0.012)
R²	0.195	0.179	0.253	0.128
Observations	416	814	944	1054

*significant at 10%, ** significant at 5%, *** significant at 1%
Note: Robust standard errors are in parentheses

Table 14: Remittances and Output Volatility per Capita – Fixed Effects – Robustness Checks

Dependent Variable: Output Volatility per Capita	Income Levels			
	Low	Lower Middle	Upper Middle	High
Constant	1.181* (0.643)	-0.148 (0.177)	0.049 (0.210)	0.808 (0.538)
Ln (GDP per capita_{t-1})	-0.283 (0.394)	0.088 (0.104)	-0.012 (0.107)	-0.386 (0.255)
Ln (GDP per capita_{t-1})²	0.039 (0.063)	-0.013 (0.014)	0.001 (0.014)	0.045 (0.030)
Ln (Remittances)	0.009* (0.004)	-0.001 (0.002)	-0.001 (0.001)	0.001 (0.002)
Ln (Terms of Trade Volatility)	0.004 (0.004)	0.004** (0.002)	0.006** (0.002)	0.006*** (0.002)
Ln (Trade Openness)	-0.892*** (0.215)	0.012 (0.034)	0.012 (0.051)	0.030 (0.049)
Ln (Government)	3.617*** (0.861)	-0.091 (0.123)	-0.027 (0.211)	-0.159 (0.213)
Institution	-9.48E-05 (6.43E-05)	1.84E-05 (2.560E-05)	-7.19E-05 (5.50E-05)	-3.50E-05 (3.42E-05)
Ln (Financial Development)	0.019* (0.010)	0.010 (0.007)	-0.004 (0.007)	0.012 (0.008)
Ln (Financial Openness)	-0.0002 (0.002)	0.0001 (0.001)	0.001 (0.001)	0.001 (0.001)
R²	0.524	0.409	0.300	0.128
Observations	356	581	657	310

*significant at 10%, ** significant at 5%, *** significant at 1%
Note: Robust standard errors are in parentheses